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Use of Bentonite in Rubber

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BENTONITE, a highly colloidal clay, has been in use in the rubber industry for approximately fifteen years, and although its range and methods of application have been continuously extended and improved, no article has appeared in the literature concerning its technology in this field, except of course in patent references. It is the purpose of this paper to fill that gap.

Bentonite is a natural clay-like substance, a hydrous silicate of alumina composed chiefly of the mineral montmorillonite. It was originally discovered in Wyoming and named for its occurrence in the Fort Benton series of rocks. For many years the name bentonite was applied only to that peculiar type of clay found in eastern Wyoming and the adjacent Black Hills region, but recently the term has been extended to cover a broad class of clay-like materials, deposits of which are found in many other localities.

These other "bentonitic" clays—so-called because they are petrographically similar—are vastly different from the Wyoming or Black Hills variety in physical activities. The latter—called "true bentonite"—may be readily distinguished from other bentonitic clays by several distinctly unique properties, chief among which is its remarkable swelling ability. It takes up six to seven times its own weight of water, expands fifteen times its dry volume, and forms plastic pastes with the consistency and appearance of heavy grease. It also has a slick, velvety feel, resembling that of soap.

When mixed with 15 to 30 times its own weight of water, bentonite produces gels or sols which are thick enough to hold pigments and other powders in suspension indefinitely, and which are also excellent stabilizers and emulsifiers for oils, fats, asphalts, etc. Its particles are so fine that they remain suspended even when diluted to the extent of 1 part in 10,000 parts of distilled water. This self-suspension is aided by the electronegative charge of the particles, as well as by their hydration and the Brownian movement which such minute specks of colloidal size acquire. Naturally, they have an immense surface area, to which can be attributed their great capacity for sorption.

Because of these qualities, a small amount of bentonite has a great capacity for thickening latex, producing mixtures which are quite stable, have less coherence and more adherence, and which are more readily vulcanizable. Its protective colloidal action makes bentonite excellent for reclaiming rubber by preventing the coalescence of the segregated particles, while its affinity for water is enlisted in the deposition of latex on molds in the formation of hollow articles. When coated on rubber, bentonite's slippery, soap-like feel is imparted to the surface to give a velvety finish and an attractive appearance.

The production of rubber dispersions involves one of the most interesting applications of this clay-like

substance. While bentonite was originally used only in latex compositions, it is now also used in dispersions of reclaimed rubber which have similar characteristics. Both dispersions are used for practically the same purposes, but the method of preparation of each is distinctly different and consequently will be discussed separately.

Bentonite's Hydrophilic Colloidal Behavior

Rubber is an excellent adhesive, as is shown by the many formulas made up with it as a base. Originally those containing the rubber dissolved in solvents, such as ordinary naphtha cements, were much more efficient than latex adhesives, even though the latter contained three or four times as much rubber per unit volume or weight of material. This was apparently due to the great cohesiveness of the latex particles, which agglomerated as the water evaporated and used up all their tackiness by cohering to one another instead of binding two objects together. After this attraction was satisfied, the left-over sticking qualities functioned for adhesiveness.

For this reason, a latex of 35% concentration is no more effective for a glue than an ordinary benzol cement containing merely 5 or 6% of rubber. However, bentonite when mixed with latex separates the latex particles so that they do not cohere to each other. It functions effectively in this way because of its hydrophilic colloidal behavior which may be described briefly under three headings:

1. It disintegrates in water into extremely minute colloidal clay particles whose infinitesimal size gives them great surface area and extensive covering power so that they have a strong protective action.
2. It absorbs water by hydration to cause thickening of latex with a resulting decrease in its Brownian movement and a consequent lessening of its tendency to agglomerate.
3. It acquires mutually repelling negative charges which furnish an electric field that promotes stabilization.

These three colloidal features permit the production of dilute latices which can be spread in extremely thin films and still show strong adhesion.

Bentonite not only enables latex to be used as an adhesive, but also adds some extra characteristics to it to give dispersions that are superior to latex alone. One of these is plasticity. As a rule latex contains 30 to 40% rubber, and in that concentration is a watery liquid which flows readily. When poured into a mold, it must be kept level to prevent running or distortion of the form. For example, fruit jar rings or other gaskets must remain horizontal or else they will have uneven thicknesses. Such a tendency to flow can be decreased by concentrating the latex or adding thickeners such as gums. But evaporation is expensive, and the resulting product has much more latex per unit volume than is needed. Furthermore, the thickening resulting in both cases merely increases the viscosity and therefore only lessens the tendency to flow without eliminating it.

Bentonite, however, as a clay with pronounced plastic properties, forms water mixtures which require force to be deformed. Unless the force is great enough to exceed its yield point, the clay will not flow. Consequently, the presence of bentonite in latex produces dispersion of the desirable rigidity, and because of its great water absorbing capacity, the percentage of it required for effectiveness is relatively small. In use, such mixtures are made thick enough so that they will not flow when acted on by gravity or the ordinary forces to which they may be subjected, but so that they can be extruded with a slightly greater force into desired shapes.

Besides its plasticity, the tendency of bentonite to acquire a "set" is also influential in this use. Its water dispersions thicken on aging because of thixotropy, and therefore have a constantly increasing yield point.

Plastic latex is self-evidently thick enough to hold mineral powders in suspension. This is particularly desirable for the production of vulcanizable compounds. As a rule, natural latex is too thin to keep the required amount of sulfur uniformly dispersed. It segregates after standing a short time to give dispersions with graded concentrations which obviously give variable finished results. The presence of bentonite overcomes such trouble by imparting suspending ability.

Such bentonite-rubber dispersions have another favorable feature. It is frequently desirable to have a concentrated adhesive, so that a small volume will have strong sticking qualities. The benzol cements cannot answer this purpose, because any concentration of rubber in them greater than 12 to 15% produces mixtures so viscous as to be unusable. They are so thick that they scarcely flow, and they penetrate only with difficulty into all the voids and interstices necessary to get a strong bond. The ready fluidity of natural latex is in marked contrast to this behavior and it is naturally quite suitable because of its 30% solids content. With the right amount of bentonite to reduce its cohesion, it forms excellent glues which may be diluted or made even more concentrated and still retain their adhesion.

While bentonite improves latex in these numerous ways, the very properties which impart such improvements make it difficult to mix with the latex. Its pronounced water absorption for instance, which enables a small amount of it to cause great thickness, is so powerful that a little bit of dry bentonite dropped at one place in the latex will soak up the water in its immediate vicinity and cause local coagulation. For this reason it is necessary to handle it in special ways to avoid difficulties in mixing.

Handling Bentonite in Latex

One such method is to make a fairly heavy paste of bentonite in water, such as one part bentonite to six or seven parts of water, and then stirring this paste slowly into the latex. A typical composition is:

Bentonite	2 parts
Water	14 parts
Natural Latex	84 parts

Inasmuch as the bentonite has taken up most of the water that it ultimately will acquire, it does not have the powerful dehydrating effect which it possesses in the dry state, with the result that blends are readily made.

With careful handling, dry bentonite can be dispersed directly in pure latex. First a small amount of some alkaline agent is dissolved in the latex and then bentonite is added to it quite slowly and with stirring. This procedure is necessary to get smooth blends because of the adsorption property of the bentonite. If it is incorporated directly with the latex, it attracts the stabilizing agents, such as ammonia, and thereby promotes coagulation. By having an additional amount of alkali present this property can be counteracted. It is essential, however, that each addition be thor-

After bentonite is dug it is hauled to stockpiles at the processing plant.

oughly dispersed before subsequent amounts are added, otherwise coagulation may result.

To assist this addition, a new variety of bentonite (called KWK Volclay No. 80) has recently been produced. A special device has been designed for metering it into the latex so that agglomerates are avoided. This is of considerable advantage because the mixing is practically automatic and does not necessarily require dilution of the latex.

In the case of dispersions produced from reclaimed or coagulated rubber which has been re-disintegrated into very small particles, bentonite can be used to assist the disintegration and to stabilize the resulting dispersions. Here again the methods of production involve special technique. The rubber is first mixed thoroughly with about 10% bentonite on an open mixing mill and then transferred to an enclosed mixer of the Day or Werner-Pfleiderer type where it is further worked and water slowly added. During this operation the temperature in the steam jacket is held at approximately 150° F. and the liquid is gradually absorbed. After 20 to 30 minutes the rubber becomes soft and flabby enough so that a hole can be poked in it with a finger and at this point the addition of water is stopped, the cover is put on the machine and the temperature raised to about 200° F. while the kneading continues. This mechanical agitation and change of temperature causes an inversion of phases to produce a dispersion of rubber in water, which is stabilized by the bentonite present. It can be used in that concentration or diluted to make a more fluid mixture.

These reclaimed rubber dispersions have many of the properties and uses of the bentonite-latex ones, in addition to some of their own. When first formed by the inversion of phases, they have a concentration of about 70% rubber, which is usually higher than that at which pure latex or latex-bentonite combinations can be handled. Consequently, they are especially suited where highly concentrated bonding agents are required. In the manufacture of abrasives, for instance, latex is generally unsatisfactory because it is either so thin that it comes to the surface during drying, or, when thickened, is too likely to coagulate even when mixed with stabilizing agents, while the consistency and stability of reclaimed rubber dispersions make them suitable for the purpose.

The thick mixtures can be diluted of course, although it may be desirable to thin them with bentonite dispersions rather than with pure water to avoid agglomeration or instability because of too great a lowering of the concentration of the stabilizing agent. The particle size of reclaimed rubber in such dispersions varies from 10 to 30 microns compared with 0.5 to 2 microns for latex.

While there are a number of modifications in the manufacturing procedure, as a rule they involve merely preferences for certain types of equipment or changes in manipulation technique. A rather significant variation, however, is to make such dispersions by milling the rubber directly into a thick bentonite paste, so that the rubber is always the internal component of the mixture. There is then no need for phase inversion. The resulting products have practically the same characteristics, regardless of their method of formation.

For some uses, such as sealing seams under high temperatures and pressures, rubber alone does not have all the properties required, and it is desirable to blend it with other agents (such as asphalt) to improve it. Such blends are generally so tough, that for making dispersions of them it is practically necessary to resort to the strong mechanical manipulation of the kneading and compounding machine with final inversion of phases.

The largest source of supply of rubber suitable for such processing is discarded automobile tires. To get the rubber, the fabric must be separated. This is done by following the above procedure for milling the tire with bentonite and water to make a dispersion. During this process the fibers are loosened from the rubber but are not necessarily cut up into fine pieces. When the resulting dispersion is diluted, the rubber and bentonite can be washed away from the fibers. It is not necessary to separate the fibers; it may be advantageous to add more of them to the mixture and then after further disintegration, run the whole mass onto a wire and collect a web of waterproof paper.

Besides acting as a stabilizer for dispersions, bentonite is also used in the surface finishing of rubber. The same properties which enable it to give soap a velvety feel and to improve the feel of paper, also function in producing a smooth finish on cured goods. This is due to its lack of abrasiveness and to its softness which is practically the same as that of talc (it has a hardness rating of 1.0 to 1.5). Furthermore, its water dispersions are very slick and slippery and when sprayed on the rubber or when the rubber is cured in them, they impart these characteristics to produce a surface which is much softer and smoother than that obtained with ordinary clays or other customary finishing agents.

One common method for applying bentonite is to make a paste of it and immerse the uncured rubber articles in this paste, which is then put in an autoclave and held at a raised temperature and pressure for a given length of time, depending on the nature of the accelerator used. With reference to this procedure, it should be noted that uniform curing depends on having a uniform temperature throughout the paste.

If a deep container is used and the paste's productivity is low, the articles located at the top and bottom of it will be over-cured while those at the center will be under-cured. To overcome this, it is only necessary to decrease the depth of the paste.

Since only a relatively small amount of bentonite is required to form a cream, the conductivity of the mixtures is not appreciably greater than that of water and the pans containing it should be quite shallow. Barytes or other non-absorbent materials, however, form pastes with a high content of solids and consequently have a much higher conductivity. They therefore can be put in deeper vessels.

Bentonite also imparts a peculiarly attractive appearance to articles upon which it is dusted. This finish closely resembles that produced by tapioca flour or corn starch which have been used extensively during curing because the surface they produce is rich and somewhat opalescent. It is apparently caused by the refractive index of the dust particles which reflect the light rays, striking them to just the right degree to give a pleasing luster. The refractive index for corn starch is 1.53; for bentonite it is also 1.53 and it is for this reason that bentonite finishes reproduce those of starch so closely. With such dusted surfaces, the curing is carried out the same way as with tapioca flour, e.g., by using high pressure steam in an autoclave.

Mention has already been made of the powerful dehydrating effect of bentonite and its consequent difficulty of mixing with latex because of a tendency to promote local coagulation. At that point this dehydration was listed as a drawback. It has been turned into use, however, in the production of goods by the dipping process in which molds or forms are immersed in latex and a film of rubber deposited on them. On withdrawal of the forms, the films are stripped off and hollow articles obtained. This deposition is customarily brought about in one of two ways:

(1) The forms may be coated with a coagulant, such as an acid, which causes the latex in its vicinity to agglomerate onto the molds.

(2) The forms may consist of a somewhat porous material like unglazed porcelain, unvitrified clay or other pervious material, which, when dipped into the latex, remove the water in their immediate vicinity and thereby acquire a thin film of latex by dehydration.

Difficulties of Deposition

The first method entails difficulties because of the corrosive nature of the acid which naturally requires special containers and necessitates the removal of acid fumes. The second occasions trouble because the pores gradually become plugged either with latex or other substances, which reduces their efficiency and results in films of varying thickness.

The water absorption capacity of bentonite naturally suggests itself in this field. A coating of it on an impervious form operates in the same way as a porous form when dipped into the latex. Taking up the water in its immediate vicinity, it causes a deposition of the rubber. However, the inherent disadvantage of gradually clogging the porous bases is eliminated because after each use the shape is recoated with a fresh deposit of bentonite so that the dehydrating power is continuously replenished.

This use of bentonite has additional advantages: the coating of it acts as an insulating sheath which prevents direct contact of the latex with the form and therefore facilitates the removal of the dried films; the absence of coagulants eliminates the necessity for subsequent washing of the articles to remove undesirable chemicals; the very presence of bentonite on the inside of the films results in the same smooth velvety finish previously described. For this dipping process, concentrated latices with about 60% solids give much better results than the natural variety containing only 30 to 40%.

Additional Uses of Bentonite

In addition to the uses described, bentonite has a number of other applications in the rubber industry. A few of these follow:

In the dipping process for applying talc or ordinary clays, rubber manufacturers frequently experience difficulty in keeping such materials uniformly distributed throughout the water. They find it necessary to stir the suspension and often have an operator devote a considerable part of his time to keeping the solids from settling. If bentonite is used either alone or mixed with these agents, no such stirring is necessary because its thickening effect keeps the other clays and talcs suspended. It is so highly colloidal that only 4 to 8% of it in water is required for effectiveness.

This suspending nature of bentonite is particularly useful in making varnished rubber surfaces. Plain, uncured rubber does not permit an even coating of the varnish or resin to be applied. When the article is first covered with the talc or clay, however, a more adherent surface is obtained which will "take" a smooth covering. If the clay is applied from a dispersion, the suspending power of bentonite is obviously advantageous. Furthermore, it allows layers of regulated thickness to be applied not only because of its suspending ability but also because of the high bonding power which adds greatly to the adherence of such layers. The improved softness and attractiveness of the resulting surfaces is another reason why it is finding continually wider application for this work.

In golf balls, bentonite pastes injected into the rubber centers produce cores of good body. After the needle is removed, the bentonite particles plug the hole to prevent the water from leaking out so that the injection can be made under pressure.

One of the methods of making sponge rubber consists in stirring the rubber dispersion with a good foaming agent, like soap, so that a large number of bubbles are worked into the mass. A difficulty with the method is that the bubbles break down under the temperature at which the rubber is cured and result in more dense sponges than are desired. The combination of bentonite with soap, however, produces bubbles which are stronger and more stable and consequently yields superior products.

Bentonite has been tried as a rubber filler but proved undesirable because it absorbs the accelerators used for curing. Were it not for this drawback it would probably be very desirable as a re-enforcing material since special micron sized grades of it are now available.

To Owners of Noble's "Latex in Industry"

The author has prepared an addenda and errata list which represents not only errors in patent numbers and typography but which includes a number of references originally omitted from the book. This list, in printed form which may be readily pasted into the original copy, is available without cost to all purchasers of the book. Address requests to THE RUBBER AGE, 250 West 57th Street, New York City.

Reclaimed Rubber*

By Henry F. Palmer

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Uses of Reclaimed Rubber: Before considering the uses of reclaimed rubber, some very definite advantages in favor of its use should be enumerated.

(1) Economies resulting from its use are very evident. The discussion of Figure 2 should have made this point apparent.

(2) The use of reclaimed rubber promotes the ease of processing rubber compounds in several ways. In the first place, the power consumption for masticating reclaimed rubber is only about 60 to 65% of that required for masticating smoked sheets. The time of processing is also reduced in that the turnover per unit mill or mixer is increased because of increased speed of mixing. The fact that most reclaimed rubber is more inert than crude rubber is of much benefit in tubing and calendering operations.

(3) Reclaimed rubber may be described as "tailor-made", "man-made" or "manufactured" rubber. For this reason it is subject to production control methods and is a decidedly uniform product as compared to crude rubber. The existence of the Crude Rubber Committee of the Rubber Division of the American Chemical Society which has been attempting to establish proper testing procedures for crude rubber for some time, is evidence in itself of the marked variability of crude rubber. A reference to the literature will show many articles, the most recent one probably being by A. E. Warner *(6)*, which point out the marked variability in crude rubber. Reclaimed rubber, on the other hand, may easily be made to specifications and as such is often the stabilizer of a rubber compound.

(4) The rate of cure of reclaimed rubber is definitely faster than that of crude rubber. This has been pointed out in two comprehensive papers *(1, 7)*.

The remarkably fast rate of cure of reclaimed rubber persists to a very great extent when reclaim is introduced as a compounding ingredient. This is evident from Figure 5. An examination of Table 3 shows that with the introduction of 10% reclaim the accelerator can be decreased in this case from 1.33% to .80% on the rubber, which is a very substantial reduction.

The use of reclaimed rubber as a compounding material has been discussed in the literature particularly for tire treads. One may refer especially to the work of Sanderson *(8, 9)*, Vogt *(10)*, and Bierer and Davis *(11)*.

In Table 3 is presented a series of formulae designed to illustrate the use and effect of reclaim in quantities up to 40%. The analysis of the tire reclaim used in this study is as follows:

Acetone Extract	10.50%
Ash	16.25
Zinc Oxide	6.75
Whiting	4.50
Clay	5.00
Carbon Black	11.00
Total Sulfur	2.25
Rubber Hydrocarbon.	60.00
Specific Gravity	1.15

* Concluded from THE RUBBER AGE, April, 1937, pp. 25-29.

TABLE 3

RECLAIMED RUBBER IN TREADS

	Control	Control 1	A	B	C	D
Smoked Sheets.....	60.	60.	53.8	47.7	41.6	35.45
Tire Reclaim..... (Sp. Gr. 1.15)			10.	20.	30.	40.
Zinc Oxide.....	2.5	2.5	2.5	2.5	2.5	2.5
Carbon Black.....	27.9	24.	23.	22.	20.9	17.65
Stearic Acid.....	2.	2.	2.	2.	2.	1.7
Pine Tar.....	4.45	4.45	2.6	1.		
B.L.E.	.6	.6	.6	.6	.6	.6
Sulfur	1.75	1.75	1.75	1.75	1.75	1.75
Mercaptobenzothiazole.	.80	.80	.48	.43	.40	.35
Clay		3.9	3.27	2.02	.25	
Totals	100.00	100.00	100.00	100.00	100.00	100.00
Cost Per Pound— S.S. @ 23c. / Recl. @ 5¾c	$.1635	$.1618	$.1567	$.1412	$.1319	$.1213
Specific Gravity.....	1.111	1.120	1.131	1.139	1.140	1.145
Rubber Hydrocarbon.	60.0	60.0	59.8	59.7	59.6	59.45
Sulfur/Rubber	2.92	2.92	2.92	2.93	2.94	2.94
Accelerator/Rubber ..	1.33	1.33	.80	.72	.67	.59
Zinc Oxide/Rubber..	4.20	4.20	5.3	6.0	7.6	8.8
Carbon Black/Rubber	46.50	40.00	40.0	40.0	40.0	38.0
Stearic Acid/Rubber..	3.30	3.30	3.3	3.3	3.3	3.3
B.L.E./Rubber	1.00	1.00	1.0	1.0	1.0	1.0
Clay/Rubber		6.50	5.45	3.36	.42	
* Ratio Vol. Load/ Vol. Rubber.....	24.7	23.7	24.2	24.4	24.1	22.8

* Including the fillers in the reclaim.

In designing these compounds, compound C was first developed as being a very satisfactory tread compound using 30% of tire reclaim. Using C as a base, the reclaim was eliminated in 10% quantities until control 1 was obtained. An examination of control 1 shows that the amount of carbon black to rubber is on the low side compared to a typical up-to-date tread compound. Accordingly, a control was made in which the amount of carbon black to rubber has been increased. Compound D was then developed in which the amount of reclaim was increased to 40%, but it is noted that here the increased quantity of reclaim necessitated a decrease in the ratio of carbon black to rubber.

The small amount of clay in the compounds is the balancing material in calculating the formulae. The important features of these compounds are the considerable decrease in the amount of softener with the introduction of reclaimed rubber, and a very appreciable decrease in accelerator with the introduction of reclaimed rubber.

The results of tests on these compounds are given in Figures 5 to 9. There is considerable information in Figures 5, 6 and 7 showing the usual tensile tests and hardness values, normal and aged, in both the Geer oven and oxygen bomb. It is evident that there is a decrease in tensile strength and elongation with the introduction of reclaimed rubber and also a stiffening effect. The rate of cure is considerably increased, so that the optimum figures are obtained in a much shorter period of time. The aging qualities of the compounds containing the reclaim are, as expected, quite satisfactory. In Figure 8 are shown the abrasion results, which are quite interesting in that over the range from control to

compound C both the normal and aged abrasion tests are quite comparable. Compound D, with the amount of carbon black decreased, shows the expected decreased resistance to abrasion.

In the flexing tests in Figure 9, a satisfactory series of results was obtained at the optimum cure through compound C. In compound D the number of flexes decreased. In other words, it is evident in this series of compounds that when the type of compounding is kept the same, and the abrasion and flexing tests are run at the optimum cures, comparable and satisfactory results should be obtained. The compounds in this series have not been road-tested but indications from the laboratory tests are that there should be some interesting results obtained.

It would represent an endless task to discuss the use of reclaimed rubber in all types of compounds because each type of compound is a specific problem. Table 4 represents an approximation of the quantities of reclaimed rubber that may be used in a variety of compounds. Although these figures must not be considered as inflexible, they represent what has been done in general practice.

In considering reclaimed rubber for any compound it must be remembered that this material is purely a compounding ingredient which presents many advantages from its use. There is a certain art which a compounder may acquire when using reclaimed rubber and he should be somewhat familiar with its effects and properties to use it efficiently. This, of course, is true in the use of any compounding ingredient.

Testing of Reclaimed Rubber

The following discussion on testing is based upon a paper *(12)* published by the author in 1934 in which the various tests applied to reclaimed rubber were discussed in detail. The shortcomings of the reclaim-sulfur test were stressed and a suggested program of testing advocated.

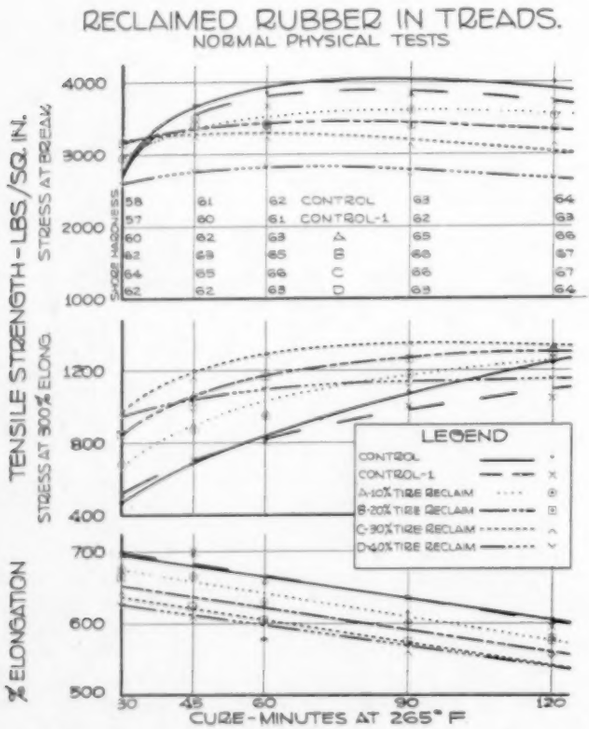

FIGURE 5.

TABLE 4

	Per Cent of Reclaimed Rubber
Tire treads, sidewall, beads	up to 40%
Tire carcasses	up to 70%
Inner tubes	up to 30%
Footwear, soles	10 to 25%
Miscellaneous hard rubber	up to 40%
Hose, insulated wire	up to 40%
Battery cases	35 to 45%
Baby cab, toy tires	30 to 50%
Heels	20 to 60%
Automobile parts, mats and running boards	up to 60%

A consideration of the testing of raw material such as reclaimed rubber includes both the manufacturer's tests for control purposes and those tests applied by the consumer whereby he endeavors to insure himself against variations in raw material purchases. The problem here is to determine the minimum number of tests involving the minimum of time and labor which will assure the consumer that his raw material is uniform and comparable to previous shipments.

In order to discuss the testing of reclaimed rubber in an orderly fashion, Table 5 presents a list of all the usual tests.

Chemical Tests:

Generally speaking, chemical tests are run for the purpose of ascertaining the constituents of the reclaim for efficient compounding. These figures in detail are supplied by the manufacturer as representative of his product. Occasionally purchasing specifications will limit some chemical constituents, e.g., manganese content or alkalinity. Inasmuch as most analytical procedures are or can be based on fundamental chemical methods, the figures are quite reproducible from one laboratory to another. While chemical tests and the laboratory procedures are important, they are not, with few exceptions, usually a serious or much disputed factor in control testing as compared to physical tests. The chemical results are generally accepted as an innate characteristic of the reclaim, and are so used by compounders.

Physical Tests:

It is necessary to classify these tests, depending upon what state the reclaim is in when tested.

Raw Or Uncured Reclaim

The processing of reclaimed rubber depends upon its condition in this state. Therefore, any tests which will indicate its processing qualities are of great value.

(1) A manual and visual test of reclaim should be the first and is the simplest test to which it may be subjected after manufacture or upon purchase. This is primarily a manufacturer's preliminary control, but is, of course, applicable to qualitative differentiation of various types of reclaim. Depending upon the sense delicacy of the inspector, this test reveals qualitatively softness, nerve, color, odor, and smoothness.

(2) The smoothness of a reclaim is easily noted by visual examination of slabs finished on refiners from the thin sheets. However, for reclaims finished on slabbing mills in thicker sheets (.010 in. to .025 in., 0.25 to 0.62 mm.) some other test is necessary. Mixing the reclaim in equal quantities with clean smoked sheets offers the simplest method. Stretching this sheet thin with the fingers will reveal lumps. Further, if a piece of the mix about 2 cm. thick is cut while hot, the lumps will be pushed out in the subsequent contraction upon

cooling and will be visible on the outer surface. Another method is to mix 50 parts of reclaim with about 10 parts of mineral rubber and 40 parts of whiting, after which it is tubed. Any unrefined lumps will show upon the tubed surface.

(3) That test which would be of most value would be one for judging the processing qualities. For this purpose, milling tests offer a great deal of information in a short time. Any laboratory can set up a procedure *(13)* for running this test suitable to its equipment, using a uniform volume of sample, roll setting, roll speed, number of cuts and temperature. A general recommendation of a sheet 0.25 in. (6.25 mm.) in thickness, low bank, low speed and cool rolls is made. Naturally a control should always be run. The number of minutes required (a) to reach a definite degree of smoothness and (b) to adhere to the back roll of the mill allows a numerical record. The former indicates inertness or speed of breakdown preparatory to pigment incorporation and the latter indicates the degree of tackiness. This test can be of immense value in gauging nerve or inertness, and degree of tackiness.

(4) Reclaims suitable for tubing work may be compared by extrusion through a ⅛ in. (3.2 mm.) die. Visual examination of the surface waviness indicates the comparative inertness qualities. This test on a nervy reclaim such as first grade alkali whole tire or tube reclaim is of little value as these reclaims are very nervy and consequently show much waviness. The reclaims then must be partially loaded to give a smooth surface.

(5) Plasticity determinations on reclaimed rubber may be carried out on pieces cut directly from the slabs or in a manner such as described by Winkelmann and Croakman *(14)*. In the laboratory a great many tests have been run on the reclaim slabs under various conditions, with the conclusion that the plasticity measurement as any sort of routine test is very variable and unreliable for reclaimed rubber. Further, it measures only resistance to flow under load at a given temperature and load, and does not interpret workability. The measurement of recovery, however, does indicate nerve very well, and in this respect may coincide in order with the smoothing time in the milling test.

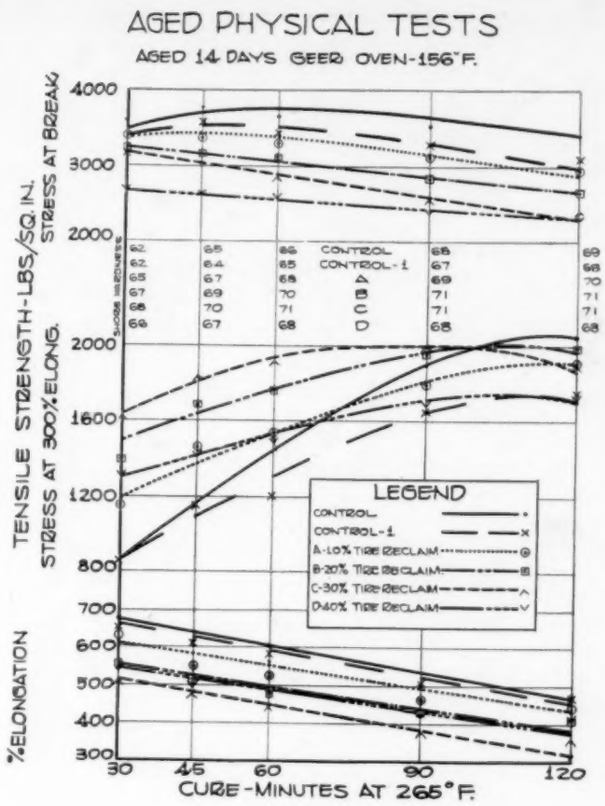

FIGURE 6.

(6) The quantity of compounding ingredients which a reclaim will take up before crumbling is often an important property, and perhaps still more important is the speed of incorporation. The relative quantities of load which reclaims will absorb may be observed by incorporating first 100% and then 25% of its weight in whiting, continuing the addition until the batch crumbles. The speed of incorporation may be noted either as (a) how much whiting or other pigment will be taken up in a given time or (b) how fast a given load is incorporated.

(7) The color of light grades of reclaimed rubber may be determined by matching the sample of reclaim alone against a control. For tube reclaims in general, however, dilution is necessary for a satisfactory color check. A simple recipe is:

Pale Crepe	50
Lithopone	25
Reclaim	25
	100

Reclaim Cured With Sulfur

It is now recognized as standard practice for all tests of reclaim cured with sulfur only to use a ratio of 100 parts of reclaim to 5 parts of sulfur. The specific gravity determination is the only property for which this mixing is really worthwhile. The tensile strength

TABLE 5

TESTS ON RECLAIMED RUBBER

I—Chemical Tests

A.—*Raw or Uncured Reclaim:*

1. Acetone Extract
2. Chloroform Extract
3. Alcoholic Potash Extract
4. Total and Free Sulfur
5. Carbon Black
6. Cellulose
7. Alkalinity or Acidity
8. Moisture
9. Ash
10. Ash Analysis
11. Special Tests; e.g., Manganese, Lead

II—Physical Tests

A—*Raw or Uncured Reclaim:*

1. Manual or Visual
2. Smoothness
3. Milling
4. Tubing
5. Plasticity and Recovery
6. Load Capacity
7. Color

B—*Reclaim Cured with Sulfur:*

1. Specific Gravity
2. Tensile, Elongation and Stress
3. Permanent Set
4. Resistance to Tear
5. Rate of Cure

C—*Reclaim in Special Test Formulae:*

1. Any usual cured rubber tests
2. Any of the tests listed under II-A on the uncured compound.

TABLE 6

Reclaim:	D-1	D-2	D-3	D-4	D-5
Specific Gravity	1.24	1.24	1.24	1.24	1.24
Reclaim 100%—Sulfur 5%—25' Cure @ 287°F.					
Tensile, lbs./sq. in.	630	900	830	1035	845
Elongation, per cent	550	570	590	530	550
Formula 2					
6' Cure @ 316°F.					
Tensile, lbs./sq. in.	590	565	590	595	580
Elongation, per cent	270	295	250	290	250

and elongation of reclaimed rubber as determined from the reclaim-sulfur mix has long been considered by many as a prime index of its quality. A study of many tests has shown this to be an unfortunate assumption. Rate of cure studies *(1, 7)* have shown that if there is a comparative time of cure to be used as a standard for reclaim-sulfur mixes it is 25 minutes at 287°F.

For the purpose of showing the probable minimum error of testing in this manner a series of tests *(12)* has shown that at best one may expect a 10% variation. Under routine conditions this may amount to 20%, which for a reclaim which should have a tensile strength of 700 lb./sq. in. and 350% elongation means an error of 70 to 140 lbs. in tensile strength and 35 to 70% in elongation. The numerical error is not excessive if one considers that based on a compound having 3000 lbs./sq. in. tensile strength and 600% elongation it amounts to about 2 to 3% in tensile and 6 to 12% in elongation. Therefore, the difficulty is due in some measure to the low base factor.

Winkelmann *(3)*, Stafford *(15)* and Hurleston *(16)* have either mentioned or protested the lack of correlation of the reclaim-sulfur test with the compounding value of the reclaim. The author has presented several examples *(12)* showing the lack of correlation of the reclaim-sulfur test with results obtained by using the reclaim in various types of compounds. Further evidence of the failure of the reclaim-sulfur tensile value to interpret the results which a reclaim will give in typical rubber compounds is shown by the following examples. Table 6 shows the results of a series of tests on a digester tube reclaim D, five different samples being tested. It will be noted that there is a variation of 405 lbs./sq. in. in the tensile value of the reclaim-sulfur mix and 60% in elongation, whereas, in type Formula 2 there is 30 lbs./sq. in. variation in tensile and 45% in elongation.

TABLE 7

Reclaim:	C-1	C-2	C-3
Specific Gravity	1.17	1.18	1.15
Reclaim 100%—Sulfur 5%—25' Cure @ 287°F.			
Tensile, lbs./sq. in.	650	675	505
Elongation, per cent	260	300	300
Formula 3			
20' Cure @ 280°F.			
Tensile, lbs./sq. in.	645	615	655
Elongation, per cent	360	390	410
30' Cure @ 280°F.			
Tensile, lbs./sq. in.	650	675	640
Elongation, per cent	340	375	380
40' Cure @ 280°F.			
Tensile, lbs./sq. in.	640	660	665
Elongation, per cent	350	360	380

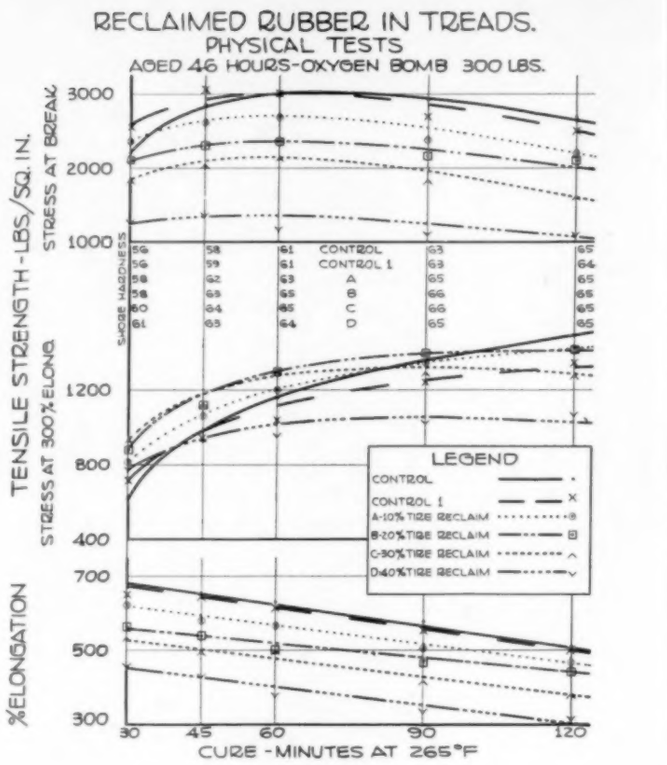

FIGURE 7.

FORMULA 2

NEUTRAL COLORED MAT

Reclaim	38.0
Smoked Sheets	4.0
Sulfur	.75
Diphenylguanidine	.25
Zinc Oxide	1.0
Clay	27.0
Whiting	25.25
Medium Process Oil	3.0
Paraffin	.5
Stearic Acid	.25
	100.0

In Table 7 are given the tests on 3 samples of an acid process tire reclaim in the reclaim-sulfur mixing compared to the tests in a typical wire insulation compound, Formula 3. The low tensile strength of C-3 in the reclaim-sulfur mix should be observed, in addition to the fact that the tests of the three samples are quite comparable in the 40 min. cure in Formula 3.

FORMULA 3

WIRE INSULATION

Reclaim	40.0
Smoked Sheets	10.0
Whiting	34.3
Mineral Rubber	10.0
Zinc Oxide	2.5
Paraffin	1.5
Stearic Acid	.5
Sulfur	1.0
Captax	.2
	100.0

A more comprehensive series of tests is given in Table 8 showing the results of a digester tube reclaim (A-1) versus pan tube reclaim (A-2), both being made from the same type of tube scrap. Reclaim A-2 shows approximately twice the tensile strength of A-1 in the reclaim-sulfur test formula. The results in Formulae

4 and 5, however, show comparable tensile values. The A-2 reclaim gives a stiffer and harder result in these formulae, which is a typical comparison of these two types of tube reclaim. The results in the reclaim-sulfur test formula reveal nothing of the behavior of these reclaims in these typical compounds.

FORMULA 4

RED FORCE CUP

Reclaim	60.0
Pale Crepe	30.0
Iron Oxide	5.0
Zinc Oxide	2.0
Trimene	1.0
Stearic Acid	.5
Sulfur	1.5
	100.0

FORMULA 5

CHOCOLATE STAIR TREAD

Reclaim	32.0
Whiting	24.625
Mineral Rubber	12.0
Clay	24.0
Iron Oxide	4.0
Zinc Oxide	1.0
Paraffin	1.0
Stearic Acid	.25
Sulfur	.875
Mercaptobenzothiazole	.25
	100.000

The evidence from the results of tensile-elongation testing on reclaim-sulfur mixes, therefore, allows certain conclusions:

(1) With best conditions and sufficient tests reproducible results may be obtained.

(2) Under routine test conditions which do not allow sufficient tests, the results are accurate at best to 10%, and will many times be much less accurate than this.

(3) The best results are not a criterion of the properties of the reclaim in the recipe in which it is to be used.

In the same category as tensile tests on reclaim-sulfur mixes may be placed other tests on this mixture, excluding, of course, specific gravity. It is fortunate that physical tests on raw reclaim do give results which enable the reclaimer to evaluate his product and check its processing characteristics as a supplement to his rigid factory control. For checking its compounding value he may use typical test formulae, or through cooperation with the consumer he may run tests in a specific test compound submitted by that consumer.

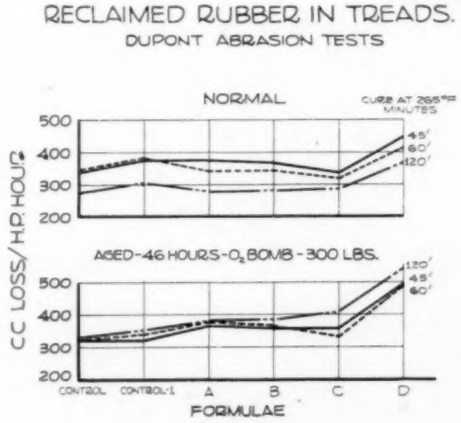

FIGURE 8.

TABLE 8

Reclaim:	A-1	A-2
Specific Gravity	1.22	1.22
Reclaim 100%—Sulfur 5%—25′ Cure at 287°F.		
Stress @ 300%, lbs./sq. in.	315	500
Tensile, lbs./sq. in.	730	1480
Elongation, per cent	510	570
Tests on Formula 4		
15′ Cure @ 298°F.		
Stress @ 600%, lbs./sq. in.	2510	2320
Tensile, lbs./sq. in.	2780	2550
Elongation, per cent	635	630
20′ Cure @ 298°F.		
Stress @ 600%, lbs./sq. in.	2520	2240
Tensile, lbs./sq. in.	2740	2480
Elongation, per cent	630	630
Shore Hardness	42	47
25′ Cure @ 298°F.		
Stress at 600%, lbs./sq. in.	2530	2300
Tensile, lbs./sq. in.	2680	2480
Elongation, per cent	620	620
Tests on Formula 5		
6′ Cure @ 314°F.		
Tensile, lbs./sq. in.	510	550
Elongation, per cent	270	195
8′ Cure @ 314°F.		
Tensile, lbs./sq. in.	540	565
Elongation, per cent	250	160
Shore Hardness	67	82
10′ Cure @ 314°F.		
Tensile, lbs./sq. in.	555	505
Elongation, per cent	220	160

In this way the reclaim manufacturer does the most he can in the way of control testing.

As an efficient procedure for the examination of reclaimed rubber by a consumer the following procedure has been recommended by the author *(12)*:

(1) On a sample shipment, a small sample from each slab may be used and the whole blended, or one random sample taken. On a carload shipment current practice is generally to take six to ten samples from the car, blending these for tests.

(2) Chemical tests for any specific constituent.

(3) Specific gravity on a reclaim-sulfur mix.

(4) Laboratory processing tests on the raw reclaim and in a test recipe, also physical tests on the cured test compound. Unless these tests are known to have a direct and accurate interpretation in reference to the actual processing and tests on the finished product, they should be omitted entirely.

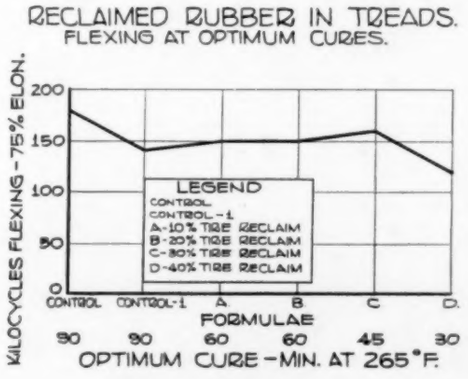

FIGURE 9.

(5) An actual factory run of one or a few mixings of a typical compound, wherein actual processing is noted and tests made on the finished product.

The results obtained in utilizing the fifth examination above are particularly satisfying both from the standpoint of the consumer and the manufacturer.

It has been a frequent occurrence in the past for consumers to hold reclaimed rubber responsible for many of the difficulties occurring in their plants. Undoubtedly this was justifiable years ago, but during the past decade very few such difficulties have been proven as due to reclaimed rubber. Any manufacturer should appreciate receiving the facts of a just complaint since they will yield him experience and knowledge through which he may profit.

The reclaimer has profited and progressed until now reclaimed rubber is definitely recognized in the rubber industry as a stabilizer of uniform production and quality. Past and current consumption in actual tonnage and in comparison to crude rubber reveals that the place of reclaimed rubber as a raw material and compounding ingredient is assured. Its use will undoubtedly expand and this expansion will be the result of both continual improvements in its quality and increased familiarity with its properties and functions by rubber goods compounders.

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Staple Fibre from Rubber

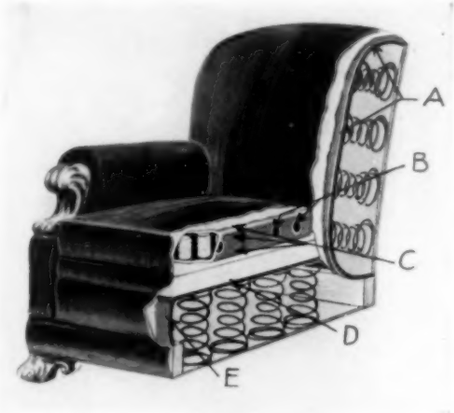
A METHOD of producing staple fibre from rubber has been developed by Professor Toyohachiro Iguchi, of the Hiroshima Higher Technical School, after fourteen years of research, according to reports from Japan. The new process is described as one which eliminates four defects inherent in the production of staple fibre from rubber, i.e., limited size and limited length of the thread, complicated production, and short life.

Because the process is still the object of patent application details are not yet available, although it is understood that important features of the rayon spinning process, such as nozzles and adjustable pressure, have been utilized. The yarn passes through a vat containing a special chemical substance immediately after leaving the nozzles.

Report also has it that the Mitsui Bussan Kaisha is negotiating with Professor Iguchi for the purchase of the patent rights when granted. It is the announced intention of the company to organize a new subsidiary for the production of staple rubber fibre under the name of the Toyo Gomu Kogyo Kaisha (Oriental Rubber Engineering Company), and a tentative factory site near Kawagoye City has already been selected.

"Rubrkovr" in Upholstering

THE use of rubber in upholstery and mattress manufacture is said to be enhanced by the development of a new process for such application under the name of "Rubrkovr" by Lyman W. Carr, Fostoria, Ohio. The process permits the elimination of springs, air-bound construction (springs encased in rubber), or the use of rubber in conjunction with springs. The



Rubrkovr is recommended for the following applications in chair construction: A—over back springs; C—over top, edge and bottom of cushion springs; D—over bottom springs; E—as a support for the front edge of the chair. B indicates air vents which should be provided in the cushion covering.

latter method is said to allow for the most complete and diversified application of rubber in upholstery to date.

The resilience of inner springs in upholstered products is of recognized importance to the comfort of the user. It is pointed out, however, that in order to overcome the feeling of the spring or spring unit by those using the finished product so much cotton, felt or other stuffing material must be used that the springs themselves are compressed or snubbed, thus reducing their effectiveness. In addition to reducing the softness of the finished product, this stuffing also exerts a pressure to each side of the mattress or cushion of from 7 to 9 pounds per square foot, according to Mr. Carr, this pressure causing strain which in turn causes spring lumpiness and shortens the useful life of the product.

Adaptation of the Rubrkovr method, it is claimed, combines the qualities of the spring unit and the rubber to give a complete unit which is soft yet resilient, firm but buoyant, permitting body conformability. The actual stuffing saved by this construction method is as much as 1 pound, 12 ounces per square foot, which on a full size mattress, for example, amounts to approximately 40 pounds.

In chair construction, Rubrkovr should be used over the back springs, bottom springs, over the top, edge and bottom springs in the seat cushion and also as a support for the front edge of the chair. Complete or partial coverage is recommended for cushions or mattresses. Advantages claimed for the Rubrkovr method include added strength to the inner units of upholstered products, permanent guard against loss of shape or sagging, complete control of spring units, elimination of lumps in cushions or seat backs and equalized tension and strain.

Rubber and Synthetic Rubber in the Graphic Arts

A Summary of the Many Uses of Rubber in the Printing and Allied Industries, Plus a Description of Some Problems

By F. G. Arnold

Chief Chemist, Rapid Roller Company

IN the graphic arts, as in many other industries, the use of rubber came into its own during the last 10 or 15 years. The printing industry is rated as the fourth largest industry in the United States. There are two principal items used in this industry made of rubber, e.g., rollers and blankets. I shall try to explain, in as simplified a form as possible, the uses of printer's blankets and rollers.

Rubber rollers are made to order; one might say that they are custom made. It is nothing out of the ordinary in a roller factory to produce from 20 to 40 different sizes and kinds of rollers in one day. These various rollers may call for different special compounds to suit the particular need of the press. In addition, various rollers call for a different finish. Some rollers call for a grain and others for a smooth surface, or for a crown of .02 inch and up, or straight face.

Different Types of Printing Presses

There are many different types of printing presses on the market, employed for various kinds of printing. To be more explicit, I shall divide them into three groups:

1. Type printing, in which the printing is done direct from the inked type or plate, like in newspaper and magazine work, letterheads, envelopes, etc.
2. Lithographic or offset printing, in which the image is transferred from an etched or chemically prepared zinc plate to the rubber blanket and then to paper.
3. Gravure printing, which is direct printing from an etched copper cylinder.

The function of the rollers used in presses in Groups 1 and 2 are about the same. Of course, a printer cannot do without rollers, as it is the principal item on the press. Before going any further, I should like to describe the function of the different rollers on a printing press. There are three kinds of rollers on a printing press, namely, the ductor, the distributors and the form rollers.

The ductor roller's work is to pick the ink out of the ink fountain and transfer it to the distributors, which in turn, break up and smooth the ink and distribute it to the form rollers. The form rollers pass the ink on to the form, which then prints the paper. For the last eighty years or so, the rollers for Group 1 were made mainly from glue, glycerine and water. Up to date there is no good substitute for this roller on certain types and classes of printing.

This paper was delivered before the May 7, 1937, meeting of the Chicago Group, Rubber Division, A.C.S.

The drawbacks of glue-glycerine rollers are that they wear out too fast and that they can not stand up against heat (caused by the friction from the speed of modern high-speed presses). This was really the main reason why roller makers began to look for a substitute for the glue roller. It must be realized that the glue composition roller maker had only two pieces of machinery to start with—his glue melting kettles and roller molds. In the mold, the roller core is centered and the glue-glycerine composition is forced into the mold under air pressure. The temperature of the composition is about 175° to 185° F., and after it is forced into the mold it is kept warm for about half an hour. It is then chilled and the roller releases itself from the mold and it is ready for use. There was nothing to making a roller a few years ago.

However, along came high-speed presses and with them fast drying inks, which are both very detrimental to glue-glycerine composition rollers. The composition would melt from frictional heat developed on the high-speed presses. The presses would have to be stopped, in order to clean the press of the melted glue, or if it was not a case of melted glue then it was the cracking of the roller surface due mainly to fast drying ink. The first thing roller makers did to overcome this trouble was to work out some method of using their glue and glycerine composition. They accomplished this by setting or tanning the glue, which made the composition non-meltable. Even with this change, they still were not able to keep up with the progress of the press manufacturers. More speed was called for by the newspaper people and it was on high-speed presses that the first rollers made of rubber were used. The roller manufacturers were then confronted with a new problem, because their roller equipment could not be used for making rubber rollers.

Difficulties of Early Rubber Rollers

When the first rubber rollers were placed on the market, modern accelerators and anti-oxidants were not yet known. Owing to this fact, these first rubber rollers did not hold up. They became sticky and swelled excessively in a short time. A specially compounded rubber material had to be used to successfully answer the requirements of the printing processes. Of course, it has to be admitted, if it had not been for the foresight of large capital to encourage and help chemists to develop synthetic products, such as neoprene, Thiokol, chlorinated rubber, hydro-chlorinated rubber, etc., the roller situation would not be as far advanced as it is today.

The second group of printing, which is offset or

lithography, is an entirely different process of printing. As I mentioned above, the roller set-up is practically the same as we have on the first group printing. But this press has an additional set of rollers called the dampener rolls. When this method of printing first came into use, a steel roller, covered with a sheepskin leather was used, a very hard and heavy roller. These rollers were used for a great many years; even today some lithographers swear by and still use them. One day a progressive young man invented a method of making a roller from vulcanized linseed oil. This roller was soon adopted as standard equipment. Today there are many kinds of rollers made from rubber or from synthetic products.

Action of the Dampening Rollers

As previously mentioned, the offset press has an extra set of rollers known as the dampening rollers. No doubt you wonder what their use is. Please keep in mind that an offset press offsets the image from an etched or otherwise chemically prepared zinc plate to a rubber blanket. Of course, you must realize that the rollers are inked across the length of the surface and naturally would ink up the entire plate. The result would be a solid ink offset across the entire plate, and, of course, the images of the etched plate would be lost.

The offset press inventor worked out a system of dampening the plate lightly, which leaves the etched part of the plate dry. This dampening is done by the dampener rollers, which are then followed by the inking rollers. The ink, being of an oil base, will not mix with the water and naturally will be deposited only on the dry etched part of the plate. The balance of the plate, being moist, repels the ink.

There is one more use for rubber rollers, which is worth mentioning. This is in connection with water color aniline inks. Rubber rollers found a great welcome in this kind of printing.

Now we come to the last group—gravure printing. Gravure, also called Entaglio, printing (printed on continuous paper rolls), uses only one roller, which is known as the impression roller. These rollers are usually quite heavy as they are used to press the paper into the etchings of the copper cylinder.

The next item used in the graphic arts is the blanket. There are three kinds of blankets: (1) Underlay blankets for newspapers; (2) Underlay for make-ready on small presses, and (3) Offset blankets.

Group 1, the direct printing from plates for newspaper presses, uses an impression blanket and drawsheet in addition to rollers. These blankets and drawsheets are used to prevent the ink from offsetting. There are various methods in use today. I believe the most extensively used method is two rubber underlays and one drawsheet. The drawsheet is stretched over the two underlays. They are usually made of nitro-cellulose, but there are a few drawsheets on the market made of synthetic plastics. The rubber underlay blanket is usually about .065 inch and a drawsheet is about .030 inch.

I shall now try to explain what is meant by repelling ink. The newspaper, as you know, is printed from rolls of paper. As the paper runs through the press it is first printed on one side and instantaneously it is printed on the other side. As the ink of the first impression is not dry, it would offset on the impression cylinder. Naturally, the paper will pick up the ink from the cylinder when the second impression is made. The newspaper would have double printed lines and would look dirty and smeared. A drawsheet or blanket made of nitro-cellulose, Thiokol, neoprene, chlorinated rubber or other synthetic products, will repel the ink and will give a clean printed paper.

Group 2 uses a very light blanket with a thickness about .020 inch. These blankets or underlays are used to preserve the make-ready, which is a stiff manila paper; it also saves the wear of type or plate.

Group 3 calls for an offset blanket. As previously explained, this blanket receives the image from an etched zinc plate. Of course, this etched plate is as perfect as it can be made and in turn the blanket also has to be perfect, as the paper is printed from the blanket and any imperfections on the blanket, even the tiniest dot or pin hole, will show up on the paper.

In the operation of the offset process there are three cylinders, instead of the usual two cylinders of the type printing. The first cylinder has the etched zinc plate, which receives the ink from the form roller. A rubber blanket is stretched, as tight as a drum, around the second cylinder. The etched cylinder, being inked, offsets the image on the blanket. The third cylinder, of course, is the tympan or impression cylinder; the paper passes between the blanket and impression cylinder and, at the same time, the paper is pressed against the blanket cylinder and the image is offset onto the paper.

A blanket for an offset press has to be well balanced to obtain the best results. For instance, the surface has to be such that it will carry the ink correctly, and so that it does not become sticky. It is inked always on the same spot. For example, in printing playing cards, the ace of hearts is always "hit" on the same spot. Naturally, being used in the same place, say for a million or more times, that spot will be pretty well inked; should the compound not be correctly balanced the blanket will either start to emboss or engrave with the result that fine prints or halftones become very heavy and blurry.

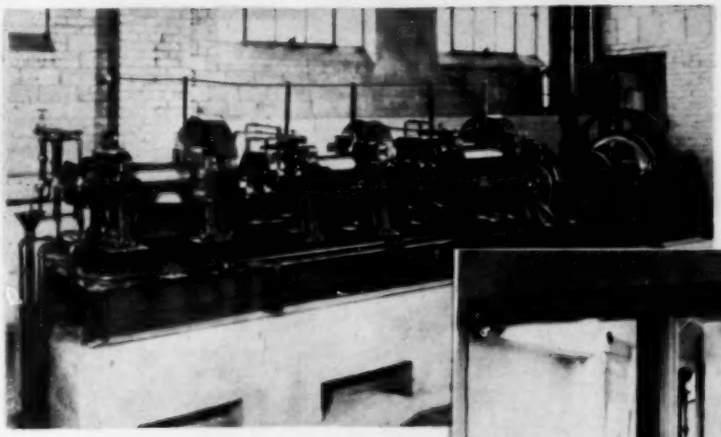
Besides rollers and blankets, there is another item which has become quite important during the last few years and that is printing plates made of rubber and more recently of Thiokol, neoprene and Bakelite. All of these plates have been used very successfully. While in London, England, last year, I had the pleasure of seeing the first rubber plate to be used for printing the English pound note. There are several advantages in printing from rubber plates instead of from metal plates, including the fact that the rollers will last longer, since they do not become scratched or damaged as the rubber gives slightly.

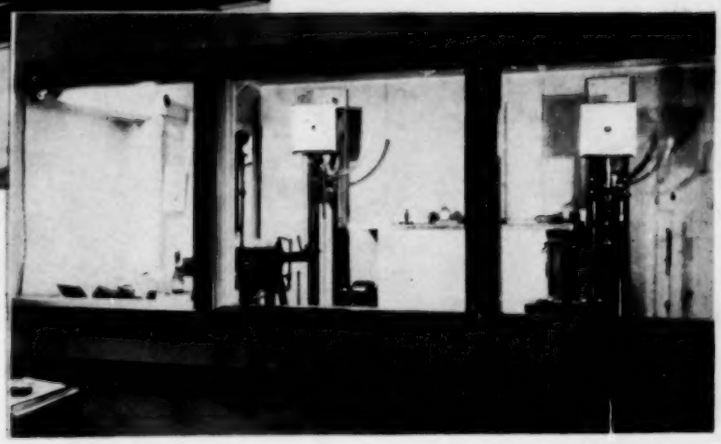
In recent years rubber latex has been put to use in the book binding trade. Also, rubber cements are used for make-ready. Besides these items there is a cutting strip used, which is made of rubber about one inch square. These strips are used on newspaper presses for cutting the paper after it has been folded.

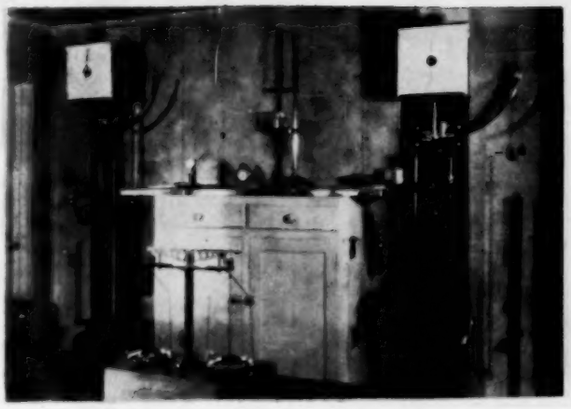
Robac Gamma—A New Accelerator

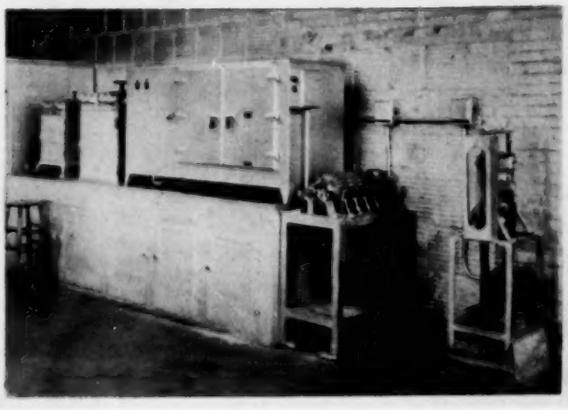
A NEW accelerator, said to be particularly suitable for low temperatures, has been developed by Robinson Brothers, Ltd., Oldbury, Birmingham, England. Cures with the new accelerator, termed Robac Gamma, can be obtained in 24 hours at room temperature, according to the company, but by varying the percentage of accelerator a wide range of curing times is securable. Although extremely fast, it can be handled in works processes with ordinary care. It is especially recommended for self-curing cements, self-curing proofings and compounding by absorption from organic solutions, and is said to work well without zinc oxide in latex. Robinson Brothers recommends the use of 1% of Robac Gamma with 1 to 2% of sulfur.

MONSANTO'S NEW RUBBER LABORATORY—IN PICTURES









The Rubber Service Laboratories Division, Monsanto Chemical Company, recently opened a new and extensive laboratory in Akron. The photos reproduced above tell a complete story of the new laboratory's equipment and adaptability to research, as follows: *Top:* a general view of the curing section of the laboratory, with presses, heaters and boilers on the right; *Center, Left:* the three mills in this experimental line are all driven by one motor but have individual controls; *Center, Right:* a view of the testing room (which is air conditioned); *Lower, Left:* a close-up of the apparatus in the testing room for testing all types of rubber stock and fabrics; *Lower, Right:* three different size Geer ovens are on the table in this scene, while adjacent to the table is an R.S.L. modification of the India flexing machine and next is a DuPont flexing machine. Photos, courtesy of Monsanto.

Vistanex—A Polymerized Hydrocarbon

RESEMBLING a pure white crepe rubber in appearance, Vistanex, a polymerized hydrocarbon of straight-chain structure, has been developed by the Advance Solvents and Chemical Corporation, New York City. It is soluble in all petroleum distillates, in Toluol, in turpentine and in some chlorinated solvents, and is insoluble in alcohols, esters, ketones, vegetable oils, etc. It has a specific gravity of approximately 0.90 (7.5 pounds per gallon).

Vistanex is compatible with such materials as rubber, paraffin, waxes in general, asphalts and petrolatums. To most mixtures it imparts a decided plasticizing action, particularly at low temperatures. Pitches, petrolatums and paraffin may be blended to form "rubbery" compounds of good flexibility and elasticity. It is incompatible, however, with chlorinated rubber, as well as with cellulose esters or ethers and most of the common lacquer plasticizers.

Mixing of Vistanex with most other materials is rapidly and effectively accomplished, according to its manufacturer, by successively milling into it small amounts of the other ingredients. Prolonged exposure above 250° F. tends to depolymerize and soften it, although one type of Vistanex (No. 6) is proportionately more stable than others. Exposure to sunlight and air produces no such oxidation or hardening in Vistanex as occurs with rubber. Free chlorine oxidizes it slowly.

Compounds of Vistanex Medium with up to 25% of rubber, neoprene or Thiokol exhibit remarkable resistance to chemicals, according to Advance engineers. These mixed compounds exhibit improved characteristics with regard to cold flow, etc., over Vistanex alone. Vistanex may be dissolved together with rubber in cements to improve aging, lessen permeability to gases and moisture and to secure other advantages. Milled mixtures should have the accelerators, sulfur, etc., worked into the rubber separately. This rubber should then be milled into the Vistanex and fillers then added. Since Vistanex does not cure by itself it may generally be ignored in calculating the sulfur content of rubber mixtures.

Substitution of 15 to 25% of Vistanex Medium for rubber in a compound is said to improve resistance to vegetable oils and fats. More than 50% substitution seems required to secure maximum chemical and ozone resistance, according to Advance.

Thermotite Adhesive

SAID to give the strongest bond of any like material on the market, Thermotite Adhesive is being featured by the Bloomingdale Rubber Company, Chester, Pennsylvania. This adhesive, reported to adhere when hot just as well as when cold, is used for bonding rubber to any kind of metal (although it will not produce good results when used against bronze), glass, plastic, hard rubber, etc. Thermotite is shipped on holland cloth.

In application the holland side is placed next to the rubber and the open side next to the metal or other surface. The rubber and adhesive is then vulcanized with sufficient pressure maintained to hold the adhesive in good contact with the other surface. Although where metal is concerned it is not necessary to brass plate the metal, the surface must be clean and free from oily substances and loose scale. The adhesive compound is flat curing and may be cured 13 minutes at 60 pounds of steam or 4 hours at the same pressure. Since DPG is used in the Thermotite compound, a compatible accelerator must be used in the adjacent compound.

The bonding surface of Thermotite is not tacky, nor can it be made tacky by means of solvents. Only the non-tacky surface has adhesive properties in this material. This surface will not move from its original point of contact with the metal or other surface. If the rubber, back of the surface, overflows sideways and comes in contact with the metal, it will not adhere to it. Thermotite may not be milled and re-calendered. Any action which tends to destroy its physical make-up will destroy the adhesive qualities, according to its manufacturer.

In lining tanks and drums, a liner is built up on a form with the layer of rubber next to the form and the non-tacky surface rolled on to the outside, so that when the liner is removed from the form and placed in the metal drum the non-tacky surface will be next to the metal. The liner should be built a few inches taller than the drum itself and supported with a strip of metal. The drum is then filled with boiling water, no water being allowed to get between the drum and the adhesive. This forces the air out between the drum and the liner. The final step is placing the lined drum in a vulcanizer.

Abalyn and Hercolyn

TWO new solvents, Abalyn (methyl abietate) and Hercolyn (hydrogenated methyl abietate), for use with rubber, chlorinated rubber and other rubber derivatives, as well as for a large number of natural and synthetic resins, have been developed by the Hercules Powder Company, Inc., Wilmington, Delaware. Although each solvent has individual characteristics, they are both said to be useful in the formulation of a number of thermoplastic and pressure-sensitive adhesive products. Abalyn, a chemically reactive product, will combine with oxygen and with certain types of phenolic resins, while Hercolyn, a more stable material which is chemically unreactive, will not undergo such reaction.

Neither of the two solvents contain water-soluble acids and do not yield acidity from hydrolysis or decomposition at temperatures to which any lacquer may be safely heated. Films containing Abalyn yellow on exposure to air and light to about the same extent as films containing ester gum. Opaque pigments, such as zinc oxide, retard yellowing. Hercolyn undergoes considerably less discoloration than Abalyn. Both solvents dissolve rubber, polycyclo rubber (Pliolite), ethyl cellulose, chlorinated rubber (Tornesit), etc. They do not boil under atmospheric pressure, their viscosity decreasing with increasing temperature. They are stable up to approximately 350° C. when incipient decomposition begins.

When used to form resinous adhesives, the new solvents are said to give increased protection against moisture penetration, resistance to sweating from the resin, and superior power to adhere to non-porous surfaces, such as metal foil, metal, highly sized paper, lacquered surfaces and cellulose foils. For pressure-sensitive adhesives, Hercolyn may be formulated into five adhesive bases, according to Hercules, each base having its own peculiar properties. A rubber-Hercolyn base, for example, is said to be extremely tacky and possessed of low film strength, while a Pliolite-Hercolyn base has a comparatively high film strength. Because of the solvent power of Abalyn and Hercolyn finished adhesives can be prepared by the incorporation of various waxes and resins through heating or solution.

Twenty Years of Progress

In the two previous issues we presented a number of reviews or digests covering developments which have taken place in the various branches of the rubber industry during the past two decades, written by leading authorities in their respective fields. These reviews are being published in connection with the 20th Anniversary of THE RUBBER AGE. Those published herewith complete the series, which, collectively, presents a panoramic view of the rubber industry's progress since 1917.

Development of Rubber Powder

By Royce J. Noble

Consulting Chemist and author of "Latex in Industry"

ALTHOUGH rubber powder has been made commercially for only a few years, development work on this material began about fifteen years ago. The earliest forms of rubber powder were quite unsatisfactory for general use, because of either the high amount of non-rubber materials used in their preparation, or the large particle size obtained. It has been recognized for some time that with the elimination of these faults, rubber powder possesses certain advantages not encountered in any other form of rubber; this is particularly true as to ease of compounding operations, economy in power consumption, and adaptability to many new and specialized uses.

One of the earliest attempts to make rubber powder was that of Westcott, using hemoglobin as a protective agent in the latex, which was powdered by spray-drying. In this process, as also in Stams' process several years later, a comparatively large amount of non-rubber material was found necessary in order to prevent the rubber particles from adhering to one another after drying. In a process developed at the Imperial Institute a coarse crumb is obtained by disintegration of a coagulum, which may contain modifying agents, between the tight rolls—a process which does not permit the formation of a fine powder. A process developed by the Dunlop Rubber Company involves the addition of a large amount of fillers to the latex, resulting in its coagulation and pulverization. Such a product, of course, is limited in use.

In the deSchepper process, latex with added protective colloid is sprayed onto a drying surface, such as a steel belt, and rapidly dried to form a powder. The particles are brushed off after dusting with zinc stearate to prevent adhesion. Another process which involves the use of only a small amount of non-rubber materials and which results in a rubber powder of fine particle size, comprises the flocculation of latex containing a small amount of protective colloid. This process yields a nearly pure rubber powder which does not easily cohere.

The uses to which rubber powder may be put fall into two general classifications: those in which it is used to replace smoked sheets or crepe rubber in standard operations, and those which are outside the rubber industry as such. In each of these fields it is finding an ever increasing number of new applications.

In the rubber industry it presents two outstanding advantages, viz.: the ease of handling and compounding and saving in power. It readily mixes in the dry state with all compounding agents and may be broken down on the rubber mill in approximately half the time required for smoked sheets. In many instances no milling is required, particularly if a very fine powder is used. It may be mixed readily with other fine compounding materials, including fibers, and satisfactory products obtained by merely molding and vulcanizing under suitable conditions. Such direct molding permits the production of the greatest variety of inexpensive rubber articles. Alternatively, compounding agents of any kind may be introduced with the latex at the time the rubber powder is prepared. In this way a composition ready for direct molding of all types of rubber articles is obtained.

Outside the rubber industry, compounded rubber powders have found many uses; in particular it has met with favor in the plastics industry, as well as in other types of manufacture, heretofore not familiar with the use of rubber. It has been found possible to prepare a completely compounded rubber powder which the molder can use in molds previously employed with Bakelite or similar materials and without investment in rubber machinery of any kind. The powder can be pre-shaped and then placed directly in the molds, and after a short cure, removed in accordance with the general procedure to which the plastics molder is accustomed. Furthermore, rubber powder may be used directly with other molding materials in powdered form, to modify their characteristics.

Rubber powder may also be used without compounding or other preliminary treatment for chemical processing such as chlorination, oxidation and the like, to produce rubber derivatives which are of great general interest at the present time. The rubber being in a very fine condition, presents a large surface for reaction directly with the chemicals employed, thus eliminating the cost of solvent.

It may also be applied to fabrics, metal surfaces, etc., as a non-corroding coating. Similarly, it may be used in preparing matte surfaces. Suitably compounded with fibers, or mineral substances, it has been used as a floor surfacing, for roadways, and for heat and sound insulation.

Insulated Wire in the Past Twenty Years

By John T. Blake
Research Chemist, Simplex Wire and Cable Co.

THE insulated wire industry has seen probably more changes in the past twenty years than has any other branch of rubber manufacturing. It has had its own special developments as well as having participated in the advances common to all rubber technology. There is little doubt that the next twenty years will witness equally important accomplishments.

The rubber insulating compounds of to-day resemble but remotely those in use in 1917. At that time the sulfur content was relatively high and many ingredients were used whose function was little understood. The high sulfur had a strong tendency to corrode conductors and the compounds were usually of a relatively low rubber content. Hard fine Brazilian Para was still being used extensively although a few companies had standardized on plantation rubbers. Reclaimed rubbers were of a poor grade and great care was needed in their selection to prevent the harming of electrical properties. There was practically no rubber insulation compounded with organic accelerators and, of course, antioxidants, as such, were missing entirely. Carbon black as a re-enforcing agent was practically unknown and there would have been no place for it in the wire industry.

This state of affairs has changed completely, paralleling the advances in all rubber technology during the period. Accelerators, lowered sulfur, antioxidants, plantation rubber, etc., have become the standard practice of the industry. The newer synthetic rubber-like materials, such as Thiokol, neoprene, and Koroseal are available for ozone and oil resistance. Improvements in rubber filling materials have been accomplished.

An important change in the industry was the introduction of hard service rubber jackets for the mechanical protection of portable cords and cables. The use of carbon black in tire tread compounds was duplicated in these jackets. Their utility was further enhanced by the use of selenium, resulting in increased abrasion resistance. Their service life was infinitely greater than when braided cotton coverings were used. Probably this type of jacket construction has been the greatest single factor in the successful electrification of mines in the United States.

Twenty years ago no attention was paid to the absorption of water by rubber although it was common knowledge that submarine cables were almost universally insulated with the expensive gutta-percha and that successful underground cables were lead sheathed. The discovery that deproteinized rubber is waterproof and the development of practical methods for its commercial production has changed the picture. Insulating compounds containing deproteinized rubber are now being used extensively on submarine and non-leaded underground cables.

Years ago it was a common practice to use the same rubber compounds for all types of electrical services. Through extensive research, the compounds are now design for their specific uses. Special ones are used for low capacity and power factor, for light and ozone resistance, for oil resistance, for low water absorption and for long life.

Accelerated aging tests had not been developed twenty years ago, but if the insulating compounds of that day had been subjected to them the life expectancy would have been but a few years. The use of high acceleration and low sulfur supplemented by selenium, tellurium and antioxidants has resulted in the so-called super-aging insulating compounds whose probable life is well over 100 years. Such compounds are also particularly adapted for exposure to relatively high service temperatures.

The use of latex or vulcanized latex for the insulating of wire is a development of interest. The rubber must be deproteinized but when applied as insulation it results in electrical properties equivalent to those obtained with ordinary compounds of four times the thickness. Such insulated wire is normally used in control and telephone cables and the thin wall of insulation produces smaller, cheaper, lighter and more easily installed cables. Vulcanized latex has found a use in the jacketing of small lamp and appliance cords and such cords are noted for their excellent appearance and serviceability.

Twenty Years in Rubber Footwear

By Robert C. Kelley
Purchasing Agent, Converse Rubber Company

RUBBER footwear is one of the oldest, if not the oldest, manufacturing industries in the rubber field, dating back to pre-Civil War days and the time of Charles Goodyear, whose discovery of vulcanization gave it its first impetus. This fact is borne out by the existence of "Goodyear" trademarks on the footwear of three out of the ten companies in the field today.

But we are concerned here with the history of the past twenty years, and for all practical purposes, we might confine it to the last ten, for this is the decade when real progress in chemistry, production, and distribution have wrought the most radical changes in the industry. The end of the War found the footwear plants running along in about the same way that they had for the previous fifty or seventy-five years. Litharge was the basic accelerator, cures were six or seven hours long, mostly in box heaters, the product was quite porous and compared to today's standard of poor quality, factory seconds were high, production was largely on an individual making basis, while labor saving machinery beyond the mill room was practically unknown.

Even the styles showed little change. Women's overshoes were of the buckle type, with black wool jersey uppers, black fleece linings and black soles. Rubber footwear seemed destined to go down into the ages in the same, somber, conventional manner. But the force of circumstances decreed otherwise. A series of mild winters, the swift growth of the automobile, and the use of mechanized equipment to clear away snow in the large centers, forced the industry

to depend upon something else beside utility and necessity to sell its product. Style and color, first in fabrics then in rubber, were employed to dress up the product and give it more eye appeal.

Chemistry played an important part in this. Organic acceleration displaced litharge, cures were shortened to an hour or two, pressure vulcanizers hitherto only used for boots and heavy goods were used for the entire line, and the old porosity and blister troubles disappeared. Shoes became lighter in weight, longer wearing, and neater in appearance. In the early twenties, five dollars at retail was the general price for a woman's galosh. Today, madam can buy a better product for ninety-eight cents.

The depression laid a heavy hand on the footwear industry. First, the export trade which used to amount to 15% of the volume was lost. Secondly, changed weather conditions and overproduction created unwieldy surpluses of merchandise. Thus an industry that did 125 million dollars worth of business in 1929 saw it shrink to 33 millions in 1932. But the industry tightened its belt and modernized. Mass production, conveyors, improved machinery, shorter production times, all played their part in revamping the footwear plants. Some of the older units were closed and production consolidated in the more efficient plants. Bit by bit the sales volume has expanded so that in 1936 the industry, as a whole, made money again.

Experience is a great teacher. While the lessons of the past twenty years in rubber footwear have been learned at bitter cost, nevertheless, we who have lived and fought through this period know that the footwear industry is now abreast of the times and will move forward with them.

Sponge Rubber—Twenty Years of Progress

By R. R. Olin
R. R. Olin Laboratories

SPONGE rubber manufacture in the dark ages of 1917 prior to the advent of THE RUBBER AGE was an art surrounded by the traditional secrecy of the old fashioned rubber manufacturer, and was then confined to a very limited "initiated few." At that time the process, which it is believed originated in Russia, consisted in destroying the nerve of the rubber by excessive milling and the addition of inordinate amounts of softeners, addition of ammonium carbonate for blowing, vulcanizing in open steam, and putting through a wringer to break the cells and cutting in to sponges. Semi-molded truss pads were probably one of the first items manufactured. Here sodium bicarbonate was substituted.

With the advent of stearic acid and increasing use of organic accelerators, it was possible to obtain a larger volume of gas from soda and to materially shorten cures. These factors made possible the production of a larger variety of molded sponge products of varying apparent density and variable cell size. Among such products may be mentioned both hard and soft rubber sponged sheets for various industries, seat cushions, kneeling pads, mattresses, upholstery, etc.

The patent literature shows many methods of forming gas for blowing sponge, e.g., urea, carbide and water, metallic aluminum and an alkali or acid, ferments like yeast, etc. It is believed, however, that for conventional methods of sponge manufacture soda activated by stearic and similar organic acids is the most practical gas forming method.

Quite recently there have been developed very efficient chemical rubber plasticizers that avoid the use of expensive mechanical softening, or large amounts of non-reinforcing softeners such as oils, fats and factice. In common with all other branches of the rubber industry there have been developed mechanical methods for continuous production of many articles.

In the early twenties there was developed in Europe a method of production of rubber "foam", or "expanded rubber", a sponge rubber material of very low density, and yet very tough and resilient. Essentially this process consisted in dissolving in or adsorbing into a vulcanized rubber compound an inert gas such as nitrogen or carbon dioxide under very high pressure (3,000 to 12,000 pounds per square inch), vulcanizing while still under pressure, and subsequently releasing the pressure. Later modifications permitted molding definite shapes by this process. Due to the high pressures required it has not been extensively used. Quite recently there has been developed in the United States a modification of this process that utilizes much lower gas pressures (850 pounds per square inch or less) and which produces sponge of many different textures. This method appears to have some commercial possibilities.

As early as 1916 there was issued a British patent for the manufacture of sponge from latex. However, it is only in very recent years that latex sponge has been commercially manufactured. One successful process consists in adding to a vulcanizable liquid latex mixture delayed action jelling chemicals and foam producing materials. The latex is then agitated, either mechanically, or by blowing a gas into it, to cause foaming. It is then poured into open molds, where it is heated at relatively low temperature to cause jelling, vulcanization, and evaporation of the water.

A method for producing microporous rubber such as storage battery separators, and other filtering plates of either hard or soft rubber, is to vulcanize liquid latex compositions in such a way as to retain the water in the article during vulcanization and so form micropores. There are many modifications of this method such as incorporating adsorbtive materials; incorporating solid materials in finely pulverized state, to be subsequently dissolved out; vulcanizing in stages to permit evaporation of water during vulcanizing; etc.

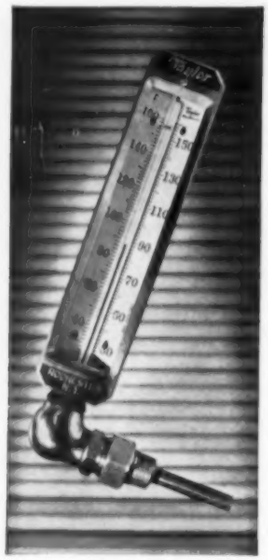
Another recent method proposes freezing the liquid vulcanizable latex and subsequently vulcanizing in such a manner as to prevent evaporation of water during vulcanization. Still another method proposes to spray liquid vulcanized or vulcanizable latex in very fine separate particles onto a surface in such a way as to form a porous rubber product.

In view of the fact that twenty years ago sponge rubber was an art rather than a science, its development has possibly been more rapid during this period than that of most other rubber products. This development has been very materially assisted by many factors. It has taken advantage of the use of organic accelerators and antioxidants and plasticizers. The working out of satisfactory methods of shipping and processing liquid latex has made possible economical production of new and better articles. The increasing application of rubber in automotive manufacture has probably been a greater stimulant to sponge rubber development than to other lines.

New Equipment

Taylor Binoc Thermometers

DEVELOPMENT of a new thermometer tubing, known as Binoc, has eliminated the difficulty of reading industrial thermometers at close range and under highly favorable lighting conditions only, according to the Taylor Instrument Companies, Rochester, N. Y. Industrial thermometers sold under the



Taylor trade-mark, incorporating Binoc tubing, are said to have the following advantages: more than twice the accustomed angle of vision combined with high magnification of the mercury column; binocular vision (readability with both eyes) at normal distances; triple-lens construction gathers three times as much light and concentrates it behind the mercury column, making the column stand out in sharp relief; elimination of empty-bore reflections by determined lens angle and extended opaque background; and improved legibility by use of bold, black numerals and graduations on a cream-tinted, non-tarnishing scale. The Taylor line of Binoc Thermometers includes all of the popular straight, angle and handled types.

Tag Celectray Recorder

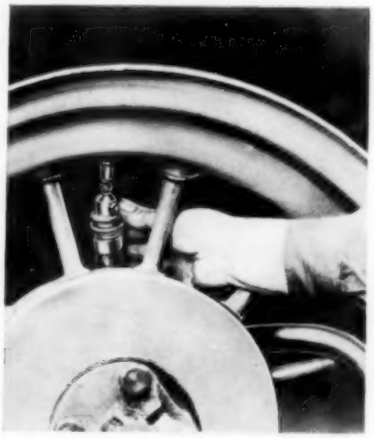
A RADICALLY new type of recorder, in which a sensitive mirror galvanometer is the controlling element, has been developed and introduced under the name of "Celectray" by the C. J. Tagliabue Mfg. Company, Brooklyn, N. Y. An inertialess beam of light in the galvanometer takes the place of the customary metal boom or pointer. The beam of light passes the "controlling edge" of a screen in moving on and off a phototube, thus operating relays which in turn control a reversing motor which drives the moving contact of the Wheatstone bridge or potentiometer. The phototube is not a calibrated element but serves only to detect the direction of the light-beam and bring the galvanometer to zero deflection, according to the null method of balancing an electric circuit. The galvanometer is free from mechanical engagement at all times, and this, plus its low moment of inertia, permits rapid balancing and control actions, according to Tagliabue. The average speed of the multiple point instrument is less than 15 seconds per

point and the accuracy is guaranteed to 0.1%. The Celectray is said to be the first instrument in which the problem of stopping a moving light-beam on the edge of a photoelectric cell with speed and precision has been solved.

Two New Schrader Instruments

TWO new instruments — a gauge developed for servicing pneumatic tires on tractors and an adapter for adding water to tractor tires — have been introduced by the A. Schrader's Son Division of the Scovill Manufacturing Company, Inc., Brooklyn, N. Y., The gauge has a calibration range from the low pressure of 4 pounds up to 50 pounds in 1 pound graduations. It is built on the Schrader direct action principles and is described as an accurate testing instrument for learning the exact pressure needed to assure best results under all weather or operating conditions. The new adapter quickly couples standard garden hose to tire valves, a feature being a deflator button which releases air that becomes trapped as the water rises in the tractor tire, making it possible to use water under any pressure. Even the force of

Right: Schrader pneumatic gauge.
Below: Schrader hose adapter.



gravity will work if the air is allowed to escape as the water in the tire increases in volume, according to Schrader engineers. Water is recommended for use in tractor tires to take the place of weights when increased traction is necessary.

Book Reviews

Proceedings of the 39th Annual Meeting. (Vol. 36). Published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Penna. In two parts, 6 x 9 in. each. $6.00 per part in cloth binding; $7.00 in half-leather.

Reports from 45 standing committees are included in Part I of the *Proceedings*, as well as some 115 tentative specifications and test methods, either newly published or revised in 1936. This part, which has 1245 pages, incorporates a detailed report from Committee D-11 on Rubber Products. The second part of this volume is devoted to technical papers, 50 of them in all. Five of the papers comprise the Symposium on the Limitations of Laboratory and Service Tests in Evaluating Rubber Products. Included in the list of subjects discussed in other papers are high-velocity tension-impact tests, damage and overstress in the fatigue of ferrous materials and creep tests on lead and lead alloys. The second part has 846 pages.

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Rubber Peptizing Agent — RPA No. 2. (Report No. 198). E. I. du Pont de Nemours & Co., Inc., Rubber Chemicals Division, Wilmington, Delaware. 6¼ x 9¼ in. 12 pp.

This report contains a full description of RPA No. 2, briefly explains what it does and tells how to use it. In the latter respect details are given for its use in connection with breaking down rubber on a mill, for breaking down rubber in a Banbury, for direct mixing from unbroken down rubber, in reclaimed rubber, for the preparation of cements, for making liquid rubber, etc. Advantages of the material are stressed, while its compounding characteristics are given. The booklet includes a number of charts and tables.

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Rubber, Its History and Uses. (Reprinted from the Encyclopedia Americana). By R. E. Powers. B. F. Goodrich Co., Akron, Ohio. 7 x 10 in. 8 pp.

Tracing the history of rubber from its discovery and primitive use by South American natives through to present-day methods of production and research, Mr. Powers has done an excellent job. Written in an easy-to-read style, the author devotes considerable space to the development of the rubber manufacturing industry in this country, interspersing his historical notes with comment on the effect of each new important discovery and invention to the general public. A number of the more important uses of rubber are briefly discussed.

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Twenty-Eighth Report of the Council. Rubber Growers' Association, Inc., 19 Fenchurch Street, London, E. C. 3, England. 6 x 9½ in. 58 pp.

Activities of the various committees of the R. G. A. during 1936 are reported in this book, that of the Propaganda Committee revealing that special attention has been paid to developing the uses of rubber in agriculture, railways, the mining industry, textiles and paints. The report reveals that in the future the activities of the Technical Research and Development of New Uses Committee will be absorbed into those of the recently organized British Rubber Research Board, brought into existence by the signatories of the International Rubber Regulation Committee.

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Tips on Cable Uses. General Electric Company, Schenectady, N. Y. 4 pp. 8 x 10½ in.

More than twenty different types of insulated cable are illustrated and briefly described in this pamphlet. They embrace types suitable for installation underground, overhead, underwater, in buildings, on bridges, etc., as well as for portable equipment, for apparatus and for general uses.

Productivity as a Remedy for Inflation. By Allen W. Rucker in collaboration with N. W. Pickering. Published by Farrel-Birmingham Co., Inc., Ansonia, Conn. 3½ x 7 in. 16 pp.

Covering three periods of the business cycle, this 21st edition of the series of booklet-editorials by the co-authors, refutes the contention that re-employment of the unemployed is to be achieved by reducing productivity per capita. The co-authors claim that the industries with the highest efficiency and employing the fewest persons per $100,000 of conversion values show the best records for increasing and maintaining total employment, and cite statistics from several industries to prove their point.

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Uses of Rubber in Commercial Horticulture. By Alexander Hay. Published by the Rubber Growers' Association, Inc., 19 Fenchurch St., London, E. C. 3, England. 16 pp. 5½ x 8½ in.

Sixth in the series of rubber and agriculture bulletins prepared for the Rubber Growers' Association by the author, its agricultural liaison officer, this latest bulletin treats with the use of rubber in horticulture, particularly pneumatic-tired equipment. A rubber-slotted pad used as a tree tie and the use of rubber fittings for cloches (in cultivation of vegetables under glass) are also described and illustrated in the bulletin.

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The Social Security Act — What It Is and What It Does. Business Information Division, Social Security Board, Washington, D. C. 8 x 10½ in. 25 pp.

This analysis of the Social Security Act has been prepared to answer the many questions that have arisen in connection with the act itself, its operation and its administration. A feature of the analysis is a section devoted to the Act's unemployment compensation angles. Every manufacturer concerned with Social Security should secure a copy of this book.

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"If I Only Had That Book." (Catalog No. 4). Chemical Publishing Co. of New York, 148 Lafayette St., New York City. 5½ x 8 in. 136 pp.

Technical books from publishers throughout the world are briefly described in this catalog, together with the names of authors and the price. Books on organic chemistry, analytical chemistry, theoretical chemistry, technical and scientific dictionaries, chemical engineering, ceramics, rubber, resins, gums, latex, etc., are listed. A valuable catalog for all industrial libraries.

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Tag Celectray Pyrometers. (Catalog No. 1101C). C. J. Tagliabue Mfg. Company, Park and Nostrand Avenues, Brooklyn, N. Y. 8½ x 11 in. 16 pp.

Containing a number of new developments, this catalog lists for the first time the newly-developed High-Speed Photoelectrically Balanced Multipoint Recorder developed by the company. Several other high-speed photo-electric action pyrometers featured by Tagliabue are described and illustrated in the catalog, including recorders, indicators, program controllers, etc.

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Industry Discovers Latex. Safetex Co., Inc., 77 Riverdale Ave., Port Chester, N. Y. 4½ x 6½ in. 6 pp.

Combining a description of the uses of latex as a coating material with that of the history of the Safetex Company, this booklet also makes mention of several actual problems brought to the company's engineers and their solution through the use of latex. Safetex recently moved to its present location.

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Special Fabricated Processing Equipment. (Bulletin No. 103.) Edge Moor Iron Works, Inc., 30 Rockefeller Plaza, New York City. 8 pp. 8½ x 11 in.

The complete line of processing equipment featured by the company, including autoclaves, ball mills, pebble mills, agitators, digesters, mixers, etc., is briefly described in this bulletin.

Editorial Comment

Labor Difficulties Can Be Settled

THE labor situation continues to occupy the center of the stage in the rubber and other industries. By far the majority of strikes are uncalled for, generally the work of practiced and experienced organizers, but it seems difficult to put an end to the spontaneity on which they are based. The rise of the C.I.O., plus the passage of the Wagner Labor Relations Act, put ammunition into the hands of labor organizers which they could not very well overlook. And so strikes are born, weathered and settled.

The past two months witnessed two major strikes in the rubber industry, those occurring at the Firestone and Thermoid factories. The first was started because labor organizers were soliciting memberships in the company's plant. It lasted two full months, and in all that time a peaceful picket line was maintained. Even though conference after conference fell flat, there was no outburst of violence. Only at one point, when maintenance men left the factory, was there even a suggestion of trouble. On the other hand, the Thermoid strike was particularly marked by violence, reaching a point at one time where the governor of the State of New Jersey was forced to send state troopers to maintain order.

If some body, preferably an impartial fact-finding agency, as President Litchfield of Goodyear recently suggested, stepped into industrial breeches as soon as they come to the surface there would probably be no such difficulty as a strike which lasts two months, causes distress to thousands of workers and injures a corporation's standing, or one which is marked by violence necessitating the calling out of state troopers.

The suggestion to remedy an evil has been made. Now what action can be taken?

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Rubber Research Marches On!

PIONEERS of the rubber industry well remember with what ridiculous secrecy manufacturers surrounded their processes. A suggestion to gather 'round the table and compare notes was regarded almost as heresy. Information was as difficult to secure as it was to supply. Countless years were lost as the result of this self-containing attitude. How cooperation was finally achieved during the World War and continued after its close is part of the industry's history.

To these pioneers recent news of research activities must be of special interest. Never before has there been such a spirit of cooperation as there exists today, with the result that the entire industry benefits, as does the consumer of rubber products in the long run. In this country, such cooperation is best found among the members of the Division of Rubber Chemistry, A.C.S. The papers presented at the periodic meetings reveal the latest data on compounding, testing, etc. The value of the Division's Crude Rubber Committee is rapidly being appreciated.

But rubber is an international commodity, so the news that rubber research stations are being organized abroad and that information from each will be handled through a central source—an international rubber research board—is especially interesting.

In accordance with the aim of the signatories of the current Rubber Regulation Agreement, research stations have been organized in England, France and Holland. All three are already in operation. At present, the international body to culminate the data secured by the individual stations, is being organized. This new group cannot help but add vastly to the knowledge of the rubber world. Its main purpose is to discover new uses for rubber above all else.

It is certain that American chemists will follow the activities of the new research group with special interest. Perhaps they may be asked to contribute in some way.

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Activity in Mechanical Goods

MECHANICAL rubber goods manufacturers are enjoying one of the best seasons they have had in a number of years. The basic reason for special activity in this branch of the rubber industry is probably due to the fact that companies in all lines of endeavor are generally expanding their activities. There is particular activity in the building field, where a number of mechanical rubber goods items eventually find their way. The record-breaking production of automobiles is also contributing its share.

To what extent the manufacture of mechanical goods has grown in importance to the rubber industry as a whole is revealed by statistics recently published by Dun and Bradstreet, Inc. These statistics show that mechanical goods accounted for 9.9% of all the crude rubber consumed in this country in 1936, as compared with 5.2% in 1929. It is interesting to note, at this point, that the amount of rubber consumed by the tire industry dropped from 84.34% of the 1929 total to 77.14% in 1936, although far more tires were produced in the latter year.

The statistical house's survey in general was heartening, showing that operations of the entire industry during the first quarter of the current year were around 90% of theoretical capacity, with production being generally 15 to 25% higher than in the first quarter of 1936.

CURRENT • NEWS
of the Rubber Industry

MAY, 1937

Rubber Division Holds Successful Meeting on University of North Carolina Grounds

140 Members and Guests Hear Presentation of 13 Papers and Attend Banquet Held at Chapel Hill Country Club; Committee Selected to Name Slate of Officers for 1938

APPROXIMATELY 140 members and guests attended the Spring meeting of the Division of Rubber Chemistry, A.C.S., held in conjunction with the 93rd meeting of the Society, in Chapel Hill, North Carolina. The Rubber Division sessions were held on April 14 and 15, in Manning Hall on the campus of the University of North Carolina. H. L. Trumbull (Goodrich), chairman of the Division, presided at both sessions. Titles and authors of the 13 papers presented follow:

Frosting of Vulcanized Rubber, W. F. Tuley, Naugatuck; *Effect of Temperature and Mill-Roll Opening on the Extrusion Qualities of Rubber*, A. H. Nellen (Lee Tire); *High-Speed Vulcanization of Rubber*, A. R. Kemp and J. H. Ingmanson (Bell Laboratories); *Notes on Determination of Free Carbon in Rubber Goods*, E. W. Oldham and J. G. Harrison, Jr. (Firestone); *An Apparatus for the Evaluation of Rubber and Rubber-Like Compositions as Vibration Absorbers*, Felix L. Yerzley (DuPont); *Colloidal Structure of Rubber in Solution*, S. D. Gehman and J. E. Field (Goodyear). These papers were delivered at the afternoon session on April 14.

7 Papers at Second Session

These papers were given at the morning session on April 15: *Purified Rubber for Electrical Insulation*, A. R. Kemp (Bell Laboratories); *Unsaturation of Rubber Vulcanized with Nitro Compounds and Benzoyl Peroxide*, John T. Blake and Philip R. Bruce (Simplex); *Scattering in the Near Infrared as a Measure of Particle Size and Size Distribution*, D. L. Gamble and C. E. Barnett (N. J. Zinc); *Impact Resilience in the Testing of Channel Black*, J. H. Fielding (Goodyear); *Influence of Metallic Oxides on Certain Physical Properties of Neoprene*, Howard W. Starkweather and Herbert W. Walker (DuPont); *Litharge As Accelerator for Chloroprene Plastic Polymer*, W. J. Clapson (Eagle-Picher); and *A Rebound Pendulum Machine for Determining the Plastic Efficiency of Rubber*, George J. Albertoni (Goodyear). Discussion followed the presentation of every paper, with considerable debate occurring on Dr. Kemp's paper on purified rubber for electrical insulation.

During the first session, Harold Gray (Goodrich), chairman of the Crude Rubber Committee, presented the fourth semi-annual report of that committee. The report revealed that satisfactory methods have been agreed upon for the determination of copper and manganese in crude rubber and that copies of these methods have been sent to interested parties in Europe and the Far East. A manuscript titled "Specifications for Testing the Variability of Normal and Concentrated Latex" was prepared and revised after criticisms were received from various American latex companies. In its revised state it has been sent to several technical organizations throughout the world for additional criticism and will then be rewritten and prepared for publication.

Seek Crude Rubber Standardization

Samples of light and dark sheet sent from the Far East have again been checked by the committee with the same results reported as heretofore, *e.g.*, that both types of sheet had the same plasticity and that rate of cure is identical. Work on plasticity has been continued but definite recommendations cannot be made as yet. Letters were received from several organizations in the Far East advising that they are actively engaged in educational programs relative to the use of proper coagulants to assist in the standardization of crude rubber.

The committee also reported that aging tests were being conducted although recommendations could not yet be made. In concluding its report, it urged the entire industry to insist upon receiving a uniformly clean product.

Mr. Gray also told the members and guests that research organizations specifically devoted to rubber problems were being organized in England, France and Holland, and that data reported by these three groups would be cleared through an International Rubber Research Association. The individual research groups have already been organized and steps for the international association are currently being taken.

Interest in International Conference

Called upon by Chairman Trumbull during the first session, R. P. Dinsmore (Goodyear) reported that at the chairman's request he had communicated with many rubber manufacturers to determine the number who might be interested in presenting papers or attending the International Conference of the I. R. I. which is to be held in London in 1938, and that about 25 chemists said they would go, 60 were in doubt and 10 said they would be glad to supply papers even if they could not attend.

Mr. Dinsmore then recommended that a special committee on papers and one on arrangements be appointed to handle the details of American participation in the conference. Although no appointments were made during the two-day meeting, Chairman Trumbull has since asked Dr. A. R. Kemp (Bell Laboratories) to pass upon the papers which will be submitted for presentation at the International Conference. Dr. Kemp is also chairman of the Rubber Division's Committee on Papers.

At the short business meeting held after the last paper had been presented on April 15, a motion was made that the editor and advertising manager of *Rubber Chemistry and Technology* be made members *ex officio* of the Executive Committee of the Division. It was unanimously approved. Chairman Trumbull urged all members to in turn urge their respective companies to support the publication through advertising since it will soon be necessary for it to be completely self-supporting.

Although no appointments to the Nominating Committee to report nominations of new officers for the 1937-38 season at the Rochester meeting next September were made at the meeting.

Chairman Trumbull has since made such appointments by correspondence. The committee includes S. M. Cadwell, as chairman, and C. C. Davis and J. N. Street. An interested visitor to the sessions was M. J. Le Bras, sent to the United States by the French Rubber Research Institute.

Approximately 225 attended the banquet which was held at the Chapel Hill Country Cub, on the night of April 14. Entertainment was furnished by a negro quartet from Sedalia College and a local hill-billy band. C. P. Hall, head of the company bearing his name, was in charge of banquet activities and merits recognition for performing an excellent job. The next meeting of the Rubber Division is scheduled for Rochester, N. Y., probably on September 8-9.

GRANT INJUNCTION IN SHOE PATENT ACTION

In accordance with a mandate of the United States Circuit Court of Appeals, Judge Robert R. Nevin, United States District Court, Cincinnati, on April 12, entered a decree in the suit of the United Shoe Machinery Corporation against the O'Donnell Rubber Products Company, Cincinnati, and the Irving Drew Company, Portsmouth, Ohio.

Judge Nevin dismissed the original suit, which alleged infringement of patents on folding sheet materials used in shoe manufacture, on July 14, 1934. Two years later the higher court reversed the decision and remanded the case. Judge Nevin's recent action in entering the decree brings the suit to an end. The decision grants an injunction to the plaintiff restraining both defendants from infringing the patents involved.

Attorneys for the O'Donnell Rubber Products Company explained that the injunction was purely a formal matter, since all disputed angles of the case have already been amicably settled, with the United Shoe Machinery Company licensing O'Donnell under the involved patents and agreeing not to sue it or its customers in connection with them.

Raze Kokomo Rubber Plant

The crumbling factory buildings of the former Kokomo Rubber Company, Kokomo, Indiana, are being razed by municipal order since they have become a menace to public safety. The action rings down the curtain on another pioneer rubber manufacturing concern. Kokomo Rubber Company was founded in 1895 by David C. Spraker, George W. Landon, and Fred Youngman, all of Kokomo, and John Neary of Dayton, Ohio. Mr. Neary, now retired at Dayton, Ohio, is the only survivor of the four founders. Bicycle tires were the main product of the company until automobile tires were added in 1915. Kokomo ceased operations in 1926.

ROBERTSON ELECTED TO HEAD GOODRICH CO.

Following a surprise announcement from James D. Tew, made before a meeting of the Goodrich 20-Year Club in Akron on May 3, that he would retire as president of the company, S. B. Robertson, executive vice-president, was

S. B. Robertson

elected to fill Mr. Tew's place at a meeting of the board of directors of the B. F. Goodrich Company held in New York City on May 5. Mr. Tew gave as his reason for retiring the fact that he had promised himself to quit active business at the age of 55. He reached that age on May 2. He will continue to serve the company as a member of the executive committee and as a director.

Joining Goodrich on January 10, 1906, Mr. Tew's job consisted of rolling and cleaning liners, for which he received 15 cents an hour, often working far longer than the 10½ hour minimum day. In 1910 he left Goodrich to join the Diamond Rubber Company and was sent by the then President Marks to England to learn the Palmer cord tire process. Upon his return he supervised the mannufacture of the first successful cord tires made for gasoline vehicles. Diamond was merged with Goodrich in 1912, and Mr. Tew returned to "his first love." In his subsequent years with Goodrich, Mr. Tew successively filled the posts of general tire superintendent, assistant works manager, works manager, vice-president and president.

Mr. S. B. Robertson, the new president, was born in Milton, Mass., in 1878 and is a graduate of M. I. T. He joined Goodrich in 1919, after having served as general superintendent of the central system of the Pennsylvania Railroad. Appointed director of engineering, he held that post until November, 1927, when he was elected vice-president and general manager of Pacific Goodrich with headquarters in Los Angeles. In September, 1931, he returned to Akron as vice-president and general manager of the tire division, and in February of this year became executive vice-president and a director. Mr. Robertson is married and has one married daughter. His chief hobbies are golf and deep-sea fishing. He is a member of the City Club of Akron and of the Portage Country, Canadian and Jonathan clubs.

COMPLETING PLANS FOR RUBBER CONGRESS

Plans are rapidly taking shape in connection with the International Rubber Congress which will be held in Paris on June 28, 29 and 30, in conjunction with the Paris International Exhibition. The Rubber Congress has been organized by the Syndicate of the Rubber and Allied Industries, the French Association of Rubber Engineers and the Union of Rubber Planters in Indo-China, in collaboration with the *Revue Générale du Caoutchouc*. Offices of the Congress are maintained at 19 Boulevard Malesherbes, Paris (8), France.

The program embraces three phases: the presentation of technical papers, visits to factories and laboratories in the vicinity of Paris, and a banquet. Latex technique, synthetic rubber and rubber derivatives will receive major attention at the Congress. French and English are the official languages, and all papers will be printed in advance, those submitted in other languages being translated. Among visits planned are those to the French Rubber Research Institute, the College de France and the French Patent Office. For all further information concerning travel accommodations, hotel reservations and other costs, interested parties are referred to Cook's Travel Service by the committee in charge of arrangements.

Budd Acquires Rayon Corp.

According to a report recently filed with the Securities and Exchange Commission, the Edward G. Budd Manufacturing Company, Philadelphia, has acquired New Process Rayon, Inc. The report revealed that on March 3, 1937, the Industrial Rayon Corporation transferred 22,125 shares of New Process Rayon stock to Budd, giving the latter concern over 50% of stock ownership. New Process Rayon has been carrying on experiments with rayon cord for use in tire construction, while Budd developed the necessary machinery.

Stalwart Buys New Plant

The Stalwart Rubber Company, Cleveland, Ohio, has purchased a factory in Bedford, Ohio. The factory, unoccupied since the World War, contains 40,000 square feet of floor space, and was owned by the Bedford Engineering Company. Approximately $5,000 will be spent to recondition the new plant, according to Herman W. Osborn, head of the Stalwart concern.

SETTLE STRIKES AT FIRESTONE, THERMOID

Strikes at the plants of the Firestone and Thermoid companies, which lasted two months and one month, respectively, have been settled. The Firestone difficulties started on March 3 when Firestone shut down Plant 2, employing 2,000 workers, after a group of organizers for the union began soliciting memberships in the plant, without union sanction according to report. The following day Plant 1, with 7,000 employees, was closed, neither management nor workers making clear the reason for this shut-down. Settlement of the strike occurred on April 28 and marked the first time that a major rubber company had signed an agreement with the United Rubber Workers of America.

The agreement, which runs until April 28, 1938, provides for a standard 30-hour week, with time and a half for over 40 hours, and grants collective bargaining rights to the union "for such of the employees who desire." It includes a clause that before any lay-offs are made working hours will be reduced to 24 hours per week for eight consecutive weeks.

Firestone further pledges to reemploy workers without discrimination, not to finance any labor group organization, to negotiate on wages if industrial conditions warrant, to provide a scale of paid vacations, to install a definite seniority system and to maintain service records for any laid-off employees. The union pledges not to coerce or intimidate any employees nor solicit memberships on company time or property and agrees not to cause or tolerate any sit-down or stay-in strikes or other stoppage of work. The strike was peacefully conducted and was marked by a seemingly apathetic attitude on the part of the management.

Terms of Thermoid Agreement

Signing of an agreement between the management and Local 83 of the U. R. W. A. on May 5 brought to an end a twenty-eight day strike at the Thermoid Rubber Company at Trenton, N. J., which was marked by violence so severe that Governor Hoffman of New Jersey ordered state troopers sent to the plant. Most of the violence occurred when non-strikers entered the plant after Thermoid had secured an injunction against the strikers from interfering with the operation of the plant.

A series of fruitless negotiations between union officials and the Thermoid management finally brought a statement from Fred E. Schluter, Thermoid president, on May 3, that "this is the last time we will confer on the present strike situation with Local 83."

An increase of 3 cents an hour for men, from 45 to 48 cents, and of 1 cent an hour for women, was provided in the agreement, in addition to a 5% general increase in wages for all employees earning less than 60 cents an hour beginning June 1. All overtime will be paid on the basis of time and a half instead of time and a third as heretofore, while all employees with four years of service or more will receive a one-week vacation with pay.

Other terms of the agreement provide for seniority rights, no discrimination of union employees, a grievance committee to be appointed by the union to meet with company officials and adjust difficulties that may arise during the term of the agreement (which is for one-year period), and the return to work of three dismissed employees, one of the issues of the strike.

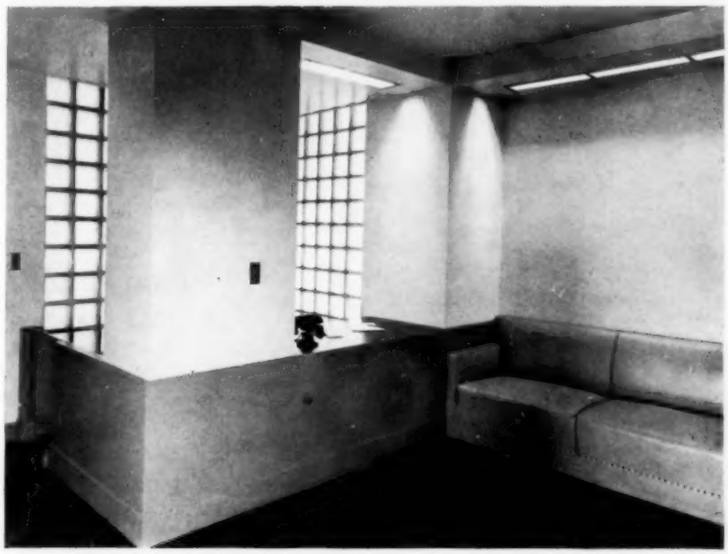
Several other rubber manufacturers were faced with labor difficulties during the month, including the Thiokol Corporation and the Joseph Stokes Rubber Company. Seven hundred employees of the Lovell Manufacturing Company, Erie, Penn., walked out on strike on April 30 demanding a closed shop. The U. R. W. A. also filed charges on April 27 against the U. S. Rubber Company with the National Labor Relations Board alleging interference with the workers' right to organize, formation of a "company union," and discrimination against union employees.

In surprise announcements, both the Goodyear Tire and Rubber Company and the B. F. Goodrich Company revealed last month that they were discontinuing financial support of the Industrial Assembly and the Cooperative Plan, respectively. Goodyear's Industrial Assembly was organized in 1919 and has often been hailed as a model for employee representation. Goodrich's Cooperative was instituted in 1933 and has never played the part in labor relations as did the Goodyear body. Although neither company would comment on the reasons for discontinuance of aid to employee organizations, it is understood the actions were taken in compliance with the Wagner Labor Relations Act.

Revertex Exhibiting at Paris

The Revertex Corporation of America, in conjunction with Revertex sales agencies in other parts of the world, will exhibit a number of products incorporating Revertex, including textiles, as well as products made solely from the concentrated latex, such as molded goods, at the Paris International Exhibition during the Summer of 1937. Stand S. 15, in the Palais du Caoutchouc, Cours la Reine, near the Place de la Concorde, has been engaged for the exhibit.

CONTINENTAL CARBON COMPANY OPENS NEW OFFICE



Glass bricks are liberally used in Continental Carbon's reception room.

Continental Carbon Company, recently organized carbon black manufacturer, has opened a suite of offices at 295 Madison Avenue, in New York City. The offices are furnished with the latest type of modern equipment, while the reception room is considerably brightened by the use of glass bricks in strategic spots. At an informal housewarming held on April 9, some of the details behind the organization of the new company were disclosed. Based on the consistent demand for carbon black, in the rubber, paint and ink fields, particularly, production of carbon black rose to more than 400,000,000 pounds last year. The men who are now the officers and directors of Continental Carbon foresaw that unless new sources of supply were made available a shortage would soon threaten. The company was immediately organized. Plans were laid for the construction of a new plant, and in an incredibly short time the plant was in operation at Sunray, Texas, in the heart of the Panhandle. According to Continental, its carbon black plant at Sunray is one of the largest and most up-to-date in the world. Production is well under way and is expected to reach 3,000,000 pounds per month by the end of this month. The plant covers 160 acres and is composed of 372 separate buildings.

LOS ANGELES HOLDS INTERESTING SESSION

Approximately ninety members and guests attended the final monthly supper of the winter and spring season of the Los Angeles Group, Rubber Division, A. C. S., held on May 4, at the Mayfair Hotel in Los Angeles. The program, longer than usual because it was the concluding meeting of the 1936-37 season, consisted of a variety of features.

One entertainer, classed as a magician and calling himself Dr. Vallee, entertained with 15 minutes of sleight-of-hand. Charles Rhodes, imitator, gave a description of "A Jaunt Down Hollywood Boulevard," imitating the various popular radio and screen stars in his presentation. Guy M. Ball, Pacific Coast Manager of the Irving Air Chute Company, Inc., Glendale, gave a lecture on parachutes under the title, "What It Means to Drop." He also showed moving pictures portraying in detail manufacturing processes, folding methods and jumping technique.

Lloyd Roberts, special representative of the Los Angeles Harbor Department, showed moving pictures of the harbor development and lectured on the growth and importance to the city and state of foreign and inter-coastal and coastwise trade. He stated that rubber stood among the top few as an import and brought out the information that the harbor in total tonnage handled now stood next to New York City. The rubber men were invited as guests of the Harbor Department in a harbor-wide excursion during the week known as Foreign Trade Week.

William Shawger of the D and M Machine Works gave a five-minute trade talk on the work of his company, a feature of the program to be continued next year, it was agreed.

The golf committee announced a golf tournament for Saturday, May 15, preferably at the Lakewood Country Club, Long Beach. Ed Royal, as chairman of the committee arranging for a summer deep sea fishing trip, announced that at least a dozen had signified their intention of going. It has not been decided, however, whether the trip will be made out of Long Beach-San Pedro harbor or out of the San Diego harbor.

Eight prizes were awarded at the meeting, one door prize and seven specials. Two special prizes donated by THE RUBBER AGE, a full vision auto mirror with clock and a similar one without clock, were won by A. Cressy of the Cressy Machine Company, and B. Renough of the Olympic Rubber Company, respectively. Five meal tickets donated by Ed Royal of the H. M. Royal Company were won by F. H. Cota (Goodyear), William J. Haney (Kirkhill), J. M. Robbins (Goodrich), Charles Lamb (West American), and Charles Rhodes, guest entertainer. A door prize of an eight-day wrist watch, donated by the Godfrey L. Cabot Company, Inc., Boston, through Bert Dougherty, local representative, was won by L. L. Horchitz (Goodrich).

The next indoor supper meeting will be held in October and so far as is now known in the same place. Carl Stentz, secretary-treasurer, reported a large growth in membership during the year and stated that the treasury was in excellent condition.

R. I. Meets on June 4

The Rhode Island Rubber Club has scheduled its next meeting for June 4 at the Pawtucket Golf Club. The meeting will consist of a golf tournament in the afternoon with the usual dinner and speakers in the evening. Prizes for the golf tournament and door prizes to holders of lucky numbers will be given, according to F. E. Rupert, president of the club.

VIEW OF RECENT LOS ANGELES GROUP MEETING

Some of the 88 members and guests who attended the April 6th meeting of the Los Angeles Rubber Group, held at the Hotel Mayfair, Los Angeles, and which was addressed by Dr. A. A. Somerville of the R. T. Vanderbilt Company, are shown above. Dr. Somerville is seated third from the left at the back.

NEW YORK OUTING SET FOR JUNE 12TH

The 1937 Outing and Picnic of the New York Group, Rubber Division, A.C.S., will be held on Saturday, June 12th, at the Alps Castle, Preakness (near Paterson), New Jersey, the site of the last two successful outings. The usual sports events, including soft ball, tennis, boccie, horseshoe pitching, swimming, golf, etc., will be held, while beer, hot dogs, and sandwiches will be served prior to the regular dinner. Special entertainment is also being arranged.

W. W. Higgins (United Carbon) has accepted the chairmanship of the Outing Committee in place of K. S. Soule (Manhattan) who was forced to resign due to pressure of other matters. Mr. Higgins will be assisted by Wm. C. Lingvall (U. S. Rubber) as assistant chairman and the following members of the Outing Committee: Golf, H. B. McCreary (United Carbon); Boccie, James Carroll (Carroll, Inc.); Soft Ball, Fred Conover (Naugatuck); Tennis, Richard Opper (U. S. Rubber); Horseshoe Pitching, D. C. McRoberts (Kaysam); and Boxing, O. G. Work (Overman Tire). Repeating last year's performance, J. Miscall will act as master of ceremonies.

Members of a general committee appointed in connection with the outing include: G. Becktel (American Oil); Carl J. Wright (General Atlas); P. Murawski (DuPont); K. Gillespie (Stamford Rubber Supply); J. R. Keating (Binney & Smith); Emil Schwartz (General Electric); K. J. Soule (Manhattan); Peter P. Pinto (THE RUBBER AGE); C. A. Bartle (DuPont); N. J. Freley (Naugatuck); G. S. Haslon (N. J. Zinc); K. Carey (Okonite); L. D. Ackerman (Seamless); Harry Trecken (U. S. Rubber); D. C. McRoberts (Kaysam); F. E. Traflet (Pequanoc); Walter Ritz (United Carbon); W. O. Hamister (Naugatuck); Philip Felderman (Muehlstein); A. H. Nellen (Lee Tire); and Wm. Malone (General Supply).

Tickets for the outing are $2.50 each, including dinner, and may be secured from B. Brittain Wilson, c/o *India Rubber World*, 420 Lexington Avenue, New York City, secretary-treasurer of the Group; from Peter P. Pinto, c/o THE RUBBER AGE, 250 W. 57 St., New York City; or from any member of the Outing or General Committees. A meeting of the committees is scheduled to be held on May 21st at the Building Trades Club, 2 Park Avenue, New York City, at which final details for the outing will probably be arranged.

Members and guests motoring to the Alps Castle should use Highway 23 out of Newark or Highway 4 which starts on the New Jersey side of the George Washington Bridge. Both the Erie and Lackawanna Railroads have Paterson stops. The picnic grounds are five miles from the depot.

DR. KEMP ADDRESSES BOSTON RUBBER GROUP

More than 135 members and guests, a record number, attended the Spring meeting of the Boston Group, Rubber Division, A.C.S., held on May 7 in the Crystal Room of the Hotel Kenmore, Boston. The feature address, "Use of Rubber in the Telephone Industry," delivered by Dr. A. R. Kemp of the Bell Laboratories, New York City, was enthusiastically received.

Explaining that the Bell Telephone System is engaged in the rubber business not only as producers but also as consumers, Dr. Kemp stated that Western Electric, the producing division of the giant set-up, produces approximately two billion feet of wire annually at its Baltimore factory. He also stated that the future expansion of both the producing and consuming ends of the rubber industry depended upon continued research.

Dr. Kemp sketched the history of submarine telegraph cable from the time it was first successfully laid in 1866 up to the present. Various stages of this development were shown in picture slides by the speaker who revealed that between 1866 and 1924 approximately 350,000 miles of cable were laid with little change in cable design. In 1924, however, a new alloy for cables, called "Permalloy" was first used, speeding up the message rendering capacity. With the aid of "Paragutta," a new insulation material adaptable to high-speed telegraph cables, in 1930, a further development occurred.

Additional films shown by Dr. Kemp included one of scenes in the Point Breeze (Md.) factory of Western Electric showing its vulcanizing equipment, mixing room, finishing room, etc., and one of scenes taken while cable was being laid off Key West, Florida, and Havana, some time ago. Another film, entitled "Business in Deep Waters," which covered the actual laying of a high-speed cable from Bay Roberts, Newfoundland, to Hotora in the Azore Islands, was also shown by Dr. Kemp. An interesting feature of this latter film was scenes showing the difficulty of holding the cable steadfast during a storm at sea.

Continuing the spirit of the meeting, a sound film featuring George Vanderbilt's recent South Sea fishing cruise, entitled "Devils Playground," was given at the conclusion of Dr. Kemp's address. Outstanding scenes in this film included a stubborn battle surrounding the landing of a giant devil fish as well as a sail fish and a tiger shark.

Canadian Group Meets

A meeting of the Rubber Section, Toronto Chemical Association, attended by approximately 85 members and guests, was held on April 30 in the Chemistry Building of the University of Toronto. The principal speaker of the evening was W. J. R. Hauser of the Heveatex Corporation, Melrose, Massachusetts, who discussed recent latex developments. At the conclusion of his address, Mr. Hauser was the target of a barrage of questions from his listeners, particularly with regard to a number of samples he exhibited. The only business transacted at the meeting was the election of a nominating committee to form a slate of officers for next season. At the conclusion of the meeting refreshments were served through the courtesy of L. D. Carver, chief chemist, Dunlop Rubber Company.

Coming Events

June 4. Meeting and Golf Tournament of Rhode Island Rubber Club. Pawtucket Golf Club, Pawtucket, R. I.

June 12. Outing of N. Y. Group, Rubber Division, A.C.S. Alps Castle, Preakness (near Paterson), N. J.

June 28-30. International Rubber Congress, Paris, France.

June 28-July 2. Annual Meeting, A.S.T.M. Hotel Waldorf-Astoria, New York City.

September 6-10. Rubber Division, A.C.S. Rochester, N. Y.

Oct. —. National Association of Independent Tire Dealers, Chicago, Ill.

October 11-15. National Safety Council. (26th Safety Congress). Kansas City, Mo.

Dec. 5-11. Exposition of Chemical Industries, Grand Central Palace, New York City.

TWO PAPERS GIVEN AT CHICAGO MEETING

The last meeting of the Spring season of the Chicago Group, Rubber Division, A.C.S., was scheduled to be held on May 7 in the College Inn of the Hotel Sherman, Chicago. Two speakers, H. D. Bainbridge of the Anaconda Zinc Oxide Division, International Smelting and Refining Company, and F. G. Arnold, chief chemist, of the Rapid Roller Company, were scheduled.

According to the advance program, Mr. Bainbridge was to speak on the subject of "A New Physical Test for Rubber Compounds," while Dr. Arnold was to deliver a paper on "The Use of Rubber and Synthetics in the Graphic Arts." Dr. Arnold is a member of the executive committee of the Chicago Rubber Group and spent many years in South America as a crude rubber expert for U. S. Rubber. (Dr. Arnold's paper is published elsewhere in this issue).

Suspend Carbon Black Rise

A proposed increase in rates on carbon black to and between all points in the United States was ordered suspended on April 20 by the Interstate Commerce Commission pending an investigation of the rates and other pertinent testimony affecting the rates. Unless the ICC orders otherwise, suspension of the new rates will be effective until November 20, 1937, with current rates continuing in effect.

CHANGES ARE MADE BY WISHNICK-TUMPEER

Melville Vaughan, formerly chief chemist at the Witco-owned Pioneer Asphalt Co. plant at Lawrenceville, Ill., has been transferred to Witco's technical staff in the East, according to an announcement from Wishnick-Tumpeer, Inc. Mr. Vaughan joined Goodrich as a tire compounder after being graduated from the University of Illinois in 1928, and joined Wishnick-Tumpeer in 1930. Since that time he has been engaged in development work at the company's plants in Louisiana, Texas and Illinois. In the East, he will work with E. M. Allen, who came to Witco last year from the research laboratories of the Columbia Alkali Corporation.

A new addition to Wishnick-Tumpeer's sales division is George T. Short, who was appointed last month. Mr. Short was graduated from the University of Vermont in 1917 and holds a B.S. in chemistry. His first position was with the Armour Fertilizer Works and later connections included the Calco Chemical, the Wilckes, Martin, Wilckes and Swann companies. At the latter company, he was assistant to the general manager, general manager and director and vice-president, respectively. When the company was merged with the Swann Corporation in 1930, he continued as vice-president, holding that position until Swann was merged with the Monsanto Chemical Company last year.

Announcement from Wishnick-Tumpeer also reveals that the Chicago office has been removed to the Tribune Tower, in the heart of the "Loop." The move was said to be necessary to provide larger and more convenient quarters. Witco now has offices in Chicago, New York, Cleveland, Boston and London, England.

New "Lastex" Policy

Pointing out that the word "Lastex" is a registered trade-mark, H. W. Waite, general manager, "Lastex" Division, U. S. Rubber Products, Inc., urges the trade not to use it as a generic term, such as silk or rayon. As an example of incorrect usage he refers to such phrases as "Blank's 'Lastex' Foundations," "'Lastex' Swim Suits," etc., indicating that the proper respective terms should be "Blank's Foundations, made with 'Lastex' Yarn" and "Swim Suits incorporating 'Lastex' Yarn." Manufacturers using "Lastex" are urged to adhere to this policy.

Making Rubber Plates

American Plastic Plates, Inc., Chicago, subsidiary of the Partridge and Anderson Company, has announced that it is installing complete equipment for the production of molded rubber and synthetic plastic printing plates for all types of printing presses and devices. The parent company is widely-known as a national electrotype concern.

Financial News

O'Sullivan Proposes Issue

The O'Sullivan Rubber Company, Inc., Winchester, Virginia, has filed a registration statement with the Securities and Exchange Commission relative to a proposed offering of $350,000 first mortgage 5½% sinking fund bonds, due April 1, 1947, with common stock purchase warrants attached, providing for the purchase of common stock in the ratio of 30 shares for each $1,000 bond, at $5.00 per share. The common stock purchase warrants must be exercised prior to April 1, 1942. Hill, Thompson and Company, Inc., New York brokerage house, will offer the bonds when approved.

Add to U. S. Directorate

Samuel B. Howard, William M. Stevens and Samuel C. Wood, all of the Corporation Trust Company of New Jersey, were elected directors of the United States Rubber Company at the annual meeting held in Jersey City on April 20. These elections increased the number of directors from twelve to fifteen. Wm. DeKrafft, chairman of the finance committee, in answer to a question raised at the meeting regarding U. S. Rubber's non-payment of dividends on its preferred stock, stated that the company's policy had been to conserve its assets and intimated that it would be several years before such dividends would be declared.

Canadian Goodyear

In a letter to stockholders covering the first quarter of the current year, A. G. Partridge, president, Goodyear Tire and Rubber Company of Canada, Ltd., reports that two of the three Canadian factories are operating at capacity and that an increase has been recorded in practically every line manufactured by the company. Discussing the rising prices of crude rubber, cotton and other raw materials, he stated that, "Fortunately, your company has a forward position of raw materials on hand or on order at prices well below the current market level."

Hewitt Rubber Corp.

March quarter: Consolidated net income of $103,553, after charges, reserves and taxes, except provision for taxes on undistributed net profits; equal to 61 cents a share on outstanding common stock at end of period. Due to recent changes in the capital structure of the company no comparison with the previous year's earnings in the similar period is available, although President Thomas Robins, Jr., reports that the 1937 first quarter earnings represent a substantial increase over those in the same period of the previous year. Mr. Robins also reported that Hewitt had sold 52,000 shares of common stock during the 1937 quarter, retiring all of the corporation's funded debt from the proceeds. Since all preferred stock was retired prior to December 31, 1936, Hewitt now has no funded debt and no preferred stock, capitalization consisting of common stock only.

Monsanto Chemical Co.

March quarter: Net income of $1,333,854, which compares with $1,032,852 in the similar quarter of the previous year; equal to $1.20 a share on 1,114,408 common shares outstanding after payment of preferred dividends, which compares with $1.03 a share on 999,123 shares in the first quarter of 1936. President Edgar M. Queeny reports that sales and earnings reached new peak levels during the quarter.

General Cable Corp.

March quarter: Net profit of $887,652, after surtax provisions, equal to 47 cents each on 550,730 common shares after quarterly dividend requirements on the 7% cumulative preferred stock and after allowing for dividends on Class A stock. Net profit for the twelve months through March 31 was $2,330,390, equal to $3.48 each on 367,253 Class A shares.

Martin Custom Made Tires

March quarter: Profit of $17,300 before adjustment of taxes and depreciation; compares with $1,740 profit in the same period of the previous year. Sales for the 1937 quarter totaled $211,507, against $106,058 in the first quarter of 1936.

Gillette Rubber Co.

For 1936: Net income of $448,445, after surtax provisions, as compared with $305,303 in 1935; 1936 profit equal to $2.24 each on 199,762 common shares, against $1.53 a common share in the previous year.

Samson Reverses Loss

For the year ending December 31, 1936, the Samson Corporation, including the Samson Tire and Rubber Company, reports a net income of $249,298. This contrasts with a loss of $9,819 reported by the corporation in 1935.

Baldwin Rubber Co.

March quarter: Net profit of $176,050, compared with $121,086 in the 1936 quarter; equal to 63 cents each on 278,604 capital shares, against 43 cents a share last year.

MARCH CONSUMPTION SHOWS 5.3% INCREASE

Consumption of crude rubber by manufacturers in the United States for the month of March is estimated to be 52,938 long tons, which compares with 50,282 long tons for February. March consumption shows an increase of 5.3% over February and is 24% above March a year ago according to statistics released by the Rubber Manufacturers Association. Consumption for March, 1936, was 42,703 long tons.

Gross imports of crude rubber for March are reported to be 52,039 long tons, an increase of 20.2% over the February figure of 43,289 long tons and 39% over the 37,451 long tons imported in March, 1936.

Total domestic stocks of crude rubber on hand on March 31, are estimated at 191,618 long tons, which compares with February 28 stocks of 193,864 long tons and 276,823 long tons on hand March 31, 1936.

Crude rubber afloat to U. S. ports as of March 31 is estimated to be 56,994 long tons which compares with 53,538 long tons afloat on February 28 and 58,935 long tons afloat on March 31 a year ago.

March reclaimed rubber consumption is estimated at 15,393 long tons; production at 14,462 long tons; and stocks on hand on March 31 at 30,277 long tons.

TIRE SHIPMENTS DROP BY 10.1% IN JANUARY

Shipments of pneumatic casings during the month of January are estimated at 4,509,240 units, a decrease of 10.1% under December but were 16.4% above shipments made in January, 1936, according to statistics released by the Rubber Manufacturers Association.

Production of pneumatic casings for January is estimated at 4,980,174 casings, a decrease of 6.2% under December but was 8.8% above January, 1936.

Pneumatic casings in the hands of manufacturers, January 31, 1937, are estimated at 11,377,015 units, an increase of 2.4% over the stocks on hand December 31 and 27.6% above stocks on hand January 31, 1936.

The actual figures are as follows:

PNEUMATIC CASINGS

	Shipments	*Production*	*Inventory*
Jan., 1937	4,509,240	4,980,174	11,377,015
Dec., 1936	5,015,872	5,311,007	11,114,399
Jan., 1936	3,875,120	4,578,994	8,917,390
Jan., 1935	3,662,615	4,626,473	10,397,667

Object to Freight Rise

The Rubber Reclaimers Association and the National Association of Waste Material Dealers, Inc., have both filed protests with the Interstate Commerce Commission against the proposed increases on scrap rubber. The increase would be from 12½ to 13%.

LOS ANGELES NEWS

Plans are practically complete for the enlargement of the plant of the Golden State Rubber Mills, Inc., to four times its present size. The company will move from its present location at 651 East 61st Street to a more central location in the city with rail facilities at hand for easy handling of its products, now shipped to all parts of the United States. A. S. Rocklen, secretary and treasurer, and in general charge, states that the business has far outgrown the present location and in spite of the fact that two full shifts are employed it is difficult to keep up with orders.

In order to handle distribution more systematically in the East a branch sales office is being established this month in New York City with Frank Donavan in charge. Mr. Donavan is now in charge of distribution in the middle west.

The leading products now manufactured in the Los Angeles plant are plumbing supplies and a great variety of items for retail sale in stationery stores, such as telephone non-slip bases, rubber stamps, etc. Recently a golf ball department has been added and the first balls were put under production this month. Mr. Rocklen feels that other types of balls used in games and sports will be added rapidly to the products after the move to the larger quarters has been made.

The Bureau of Foreign and Domestic Commerce of the Department of Commerce, Washington, D. C., has issued a pamphlet entitled "Around the World with Rubber," based on a radio broadcast over Station KRKD, Los Angeles, on April 15, in which broadcast Charles N. Merralls, president of the Rubbercraft Corporation of America and president of the California Rubber Manufacturers' Association, was interviewed by J. Edgar Dick, commercial agent for the Bureau.

The interview covered in considerable detail the history of the origin, early discouragements, and subsequent development of the rubber industry. It covered also the subject of the use of rubber in moving picture props and stage equipment. The interview was conducted quite largely as a questionnaire, Mr. Dick asking the questions and Mr. Merralls answering them.

Mr. Merralls also brought out the importance of the industry in the general economic life of the people of this country and of the world. "There are," said Mr. Merralls, "more than 150,000 of our people in this country engaged directly in the production of rubber goods. California is next to the state of Ohio in production of rubber goods." He pointed out that thirty-eight million dollars worth of rubber products were made in California in 1935 and one million dollars worth from this total were exported. Mr. Merralls stressed also the auxiliary industrial developments dependent upon rubber and now existent because of the development of the rubber industry.

The Wayneway Rubber Manufacturing Company, 2248 East 37th Street, is practically doubling its capacity through the installation of new machinery and taking on of more floor space, according to H. N. Wayne, one of the proprietors. Two of the chief mechanical items being installed are a 54-inch mill and a 6-inch tuber. This firm specializes on sponge rubber products and oil field specialties, but also makes a general line of rubber appliances. A latex department is being added in the present enlargement program.

The demand for rubber greens, or rubber parsley, for use primarily in meat displays in refrigerated display cases, is growing by leaps and bounds, according to John P. Gleason, Manufacturer, 1882 West Washington Boulevard, Los Angeles. The sheet rubber which is die-cut to make the green leaves was worked out cooperatively by Mr. Gleason and a Los Angeles rubber manufacturer and the whole process has behind it one of the many interesting chapters in the story of rubber products development. Starting with pound volume the output now runs into ton volume. More natural appearance of the green leaf has been a major triumph in this particular product during the last eighteen months.

Launches New "Squadron"

Using its 37,000-acre ranch at Litchfield Park, Arizona, as a training ground, the Goodyear Tire and Rubber Company, Akron, has launched an organization to be known as the Future Farmers' Flying Squadron, which will provide an all-around, three-year training course in practical and theoretical farming for its members. At the conclusion of their training, squadron members who have proved their ability to support themselves in agricultural pursuits will be given an opportunity to purchase their own tracts of land and establish themselves as independent farmers. Twelve young men, between the ages of 19 and 24, have been selected for the purpose of the original experiment, and are already undergoing initial training.

To Deliver Ford Equipment

Delivery by the National Rubber Machinery Company, Akron, of tire building equipment for the Ford Motor Company's new tire factory is scheduled to begin on June 1st, according to a formal statement issued by National Rubber. The statement revealed that the order called for 300 dual tire vulcanizers, all to be delivered within 100 days from June 15. In addition to the dual tire vulcanizers, National Rubber Machinery is also supplying 74 inner tube vulcanizers to Ford. Based on this order, it is estimated that the Ford plant will be capable of producing 18,000 tires a day.

TRENTON NEWS

Employees of the Joseph Stokes Rubber Company, Trenton, staged a short strike last month. Approximately 700 workers left the plant, but remained on the premises. They demanded a 50% increase in pay, but called the strike off when M. M. Martindell, vice-president of the company, granted a 15% increase. Employees of the Thiokol Corporation, Yardville, also walked out on strike in late April asking for wage increases. No settlement has been arrived at at this writing. (Details of the Thermoid labor difficulties will be found elsewhere in this issue.)

John T. Crowley, president of the Lambertville Rubber Company, Lambertville, has been appointed temporary trustee of that company following the filing of a petition by the United Shoe Machinery Corporation, the Lynn Specialty Company and Bird and Sons, Inc., all of Massachusetts, in the U. S. District Court at Trenton seeking reorganization of the company under Section 77B of the 1936 Bankruptcy Act. The three creditors alleged that Lambertville's present income is insufficient to meet operating charges. The company, manufacturers of rubber boots and footwear, closed down its plant recently because of lack of orders. Mr. Crowley expressed the opinion that the plant would soon resume operations.

Puritan Rubber Company, Trenton, has let a contract for a brick factory addition which will cost approximately $5,000.

Dural Rubber Company, Flemington, which ceased operations several months ago, has been offered for sale.

Organize Research Board

The British Rubber Research Board has been set up to take charge of the British section of the research and development of new uses for rubber contemplated by the signatories of the International Rubber Regulation Agreement. Similar boards have been set up in France and Holland, while an International Rubber Research Association, combining the efforts of all three boards, will shortly be organized. The British section held its first meeting last month in the Colonial Office, London, and H. Eric Miller, the only member representing the signatory countries, was elected to the chairmanship, with Sir Frank Stockdale as vice-chairman. Sir Stockdale is Agricultural Adviser to the Secretary of State for the British Colonies. Other members of the board include P. J. Burgess, W. J. Gallagher, Prof. W. N. Harworth, Prof. E. K. Rideal. Peculiarly, the Research Association of British Rubber Manufacturers is not directly represented on the board.

NEW ENGLAND NEWS

Sponge Rubber Products Company, Shelton, Conn., has purchased the former property of the Premier Potter and Seybold Company on Canal Street for approximately $17,000 and will use the building to expand its present manufacturing facilities. The company makes a wide variety of sponge rubber goods, including bath sponges, seat cushions, bath mats, hospital mats, garden mats, under-mats, toys and novelties.

A fire, followed by explosions, in a chemical storeroom of the Stratford, Conn., plant of Raybestos-Manhattan, Inc., on April 9, caused damage estimated at about $20,000. Tanks which caught fire contained chemicals in which brake-lining is treated before being baked. Firemen prevented the blaze from spreading to other sections of the plant.

Sweet Wire Corp. has been incorporated at 138 Rowley Street, Winsted, Conn., to manufacture and deal in insulated wire machinery, etc. Paid-in capitalization is $8,000. James E. Sweet is president; Benjamin Nero, secretary; and Winthrop V. Hayes, treasurer, all of Winsted.

Charles Blake, president of the Elm City Rubber Company, New Haven, Conn., manufacturers of bathing caps and baby pants, and Herbert Dawson, CIO organizer, announced jointly on May 1 the settlement of a strike which had kept the company's 70 employees idle since March 23. The terms of the settlement were not disclosed, but were described as being satisfactory to both parties in the dispute. Higher wage rates, shorter hours and improved working conditions had been demanded by the strikers.

Seamless Rubber Company, New Haven, has started a program of plant alterations designed to improve production facilities.

Maynard J. Creighton, general manager, Zapon Division, Atlas Powder Company, Stamford, Conn., has been elected to the board of directors of the Atlas company, which he joined in 1915 after being graduated from the University of Maine. In 1924 Mr. Creighton became associated with Zapon and became general manager of the division in 1935. In this capacity he has charge of all cellulose products manufacture and all sales for the company, including industrial finishes and coated fabrics. He is also in charge of the Zapon-Brevolite division with plant and offices at North Chicago, Illinois.

Stanley Chemical Company, New Britain, Conn., a subsidiary of the Stanley Works, recently made a shipment of lacquer to the Netherlands East Indies to be used in the coating of rubber products. Announcement of the shipment indicated that the company's business is now becoming international. Sales volume of Stanley Chemical is showing steady increases.

Members of the New Haven Section, A.C.S., connected with the Naugatuck Chemical division and other divisions of U. S. Rubber Products, Inc., played hosts to that group at a meeting held on May 4 in Naugatuck, Conn. A supper was served in Hall's Tavern, Naugatuck, followed by a business meeting in the Salem School's auditorium. Theodore F. Bradley, of the American Cyanamid and Chemical Company, spoke on "Synthetic Resins" and Kent T. Healy, assistant professor of transportation at Yale University, discussed "High Speed Trains."

Armstrong Rubber Company, West Haven, Conn., has announced plans for a new building at its plant which will house a Banbury and other equipment. The structure will be 41 x 81 feet, three stories high with basement, and will be of concrete construction. There will also be a connecting building, 30 x 60 feet, one story, also of concrete.

Preparing 1937 Directory

The 1937 Rubber Red Book, the first directory of the rubber industry to make its appearance in ten years, is currently being prepared for publication by THE RUBBER AGE. An outgrowth of the Annual Bibliography of Rubber Literature which was first brought out last year, the 1937 Directory will feature the Bibliography of Rubber Literature for 1936. In addition to the Directory of Rubber Chemicals which was part of last year's bibliography, the 1937 Rubber Red Book will also contain a complete directory of rubber goods and their manufacturers in the United States and Canada; a directory of all rubber machinery and equipment with the names of the manufacturers thereof: a fabrics directory: a crude rubber directory: a scrap and reclaimed rubber directory. etc. Questionnaires have been sent to every rubber manufacturer and manufacturer of machinery and equipment in this country and Canada. Any manufacturer, either of rubber goods or machinery, that has not received one of these questionnaires should write to THE RUBBER AGE, 250 West 57th Street, New York City, in order that they may be fully and properly listed in the 1937 Rubber Red Book. No price has yet been established on the Directory, which will be published within the next few months. Both paper and cloth-bound copies will be available.

TEW WARNS WORKERS ON "NEW THEORIES"

Addressing 1600 members of the Goodrich 20-Year Club in Akron on May 3, at the conclusion of which he announced his intention to retire as president of the company, James D. Tew warned his listeners "to discourage the adoption of new and unproved economic theories which are now so popular in foreign countries." He declared that "the only really free countries on earth today are the capitalistic countries."

Reviewing trends since the World War, the speaker said that the troubles of mankind produced a horde of "witch doctors" throughout the world "who held out glowing promises and in some countries the people even gave up their liberty, their freedom of thought, action and speech to follow false prophets, promising them a cure-all for their ills."

Stating that "actually, the tools with which you and I work are furnished by more than 24,000 people—the stockholders of the Goodrich company," Mr. Tew stressed the point that a partnership exists between capital, labor and government, urging all Goodrich employees to take an active and interested part in letting public office-holders know that honest and sincere government is expected in return for the money contributed to government in the form of taxes.

Vultex Suit Decision

A decision in the suit brought by the Vultex Corporation of America against the Heveatex Corporation, alleging infringement of U. S. Patents 1,443,149 and 1,682,857, covering the vulcanization of latex with heat and under pressure and the vulcanization of latex at low temperature, respectively, was handed down on April 23 by Judge J. Brewster of the District Court of the United States, District of Massachusetts, in favor of the defendant. With respect to the first patent (1,443,149), Judge Brewster held that the claims in suit were valid but not infringed, pointing out that the claims must be construed to mean a completely vulcanized product which is stable, requiring no further vulcanizing steps after coagulation. On the second patent (1,682,857) he held that none of the claims relied upon in suit are valid, and if valid they are not infringed.

Reorganize Oak Hill Co.

The Oak Hill Rubber Company, which was organized in 1924 and which was recently purchased by W. A. Byrider, Jr., at a sheriff's sale, has been reorganized. In the future it will be known as the Oak Hill Sponge Rubber Company. The reorganization became effective April 16, 1937. The former personnel has been retained. L. P. Waldron is president of the concern, while W. A. Byrider, Jr., is secretary-treasurer.

Names in the News

HOWARD I. YOUNG, president, American Zinc, Lead and Smelting Company, has been elected president of the American Zinc Institute. The annual meeting of the Institute was held on April 28-30.

L. M. FREEMAN, manager, raw materials department, B. F. Goodrich Company, Akron, discussed "Fundamentals in Adequate Control of Health Hazards Through Compounding in the Rubber Industry" at the 8th Annual Ohio Safety Congress, held in Columbus, the week of April 20.

CARL H. ZIEME, service engineer, Republic Rubber Division, Lee Tire and Rubber Corporation, Youngstown, Ohio, spoke before a meeting of the Youngstown Kiwanis Club on April 21 at the Hubbard Country Club. His subject was "Products of the Rubber Industry."

ED SHAW, associated with the Monarch Rubber Company for the past five years, and previously superintendent of the Northern Rubber Company, has been named factory manager of the reorganized Fremont Rubber Products Company, Fremont, Ohio. HOWARD M. POTTER was recently named president of the organization.

P. C. HANDERSON, advertising director, B. F. Goodrich Company, Akron, has been selected as a member of the national advisory staff of the Royal Lion Automobile Clubs, Stockbridge, Michigan. The Royal Lion group now includes more than 20,000 members, consisting of young men between 12 and 21.

J. E. POWER, manager of mechanical sales, has been appointed assistant sales manager, mechanical goods division, U. S. Rubber Products, Inc. He will make his headquarters at 1790 Broadway, New York City. He has been with the company since 1906.

RAYMOND G. BOYD, Goodrich tire engineer, has returned to the Akron factory after a three-year sojourn at the company's plant in Yokohoma, Japan. He arrived aboard the *Queen Mary* late last month.

WILLIAM HOHWIELER, president, Hohwieler Rubber Company, Morrisville, Penna., has been appointed a member of the Sea Scout Committee of the Morrisville Chamber of Commerce.

RUSSELL J. HOLLINGER, recently appointed superintendent of the Goodyear plant at Wolverhampton, England, sailed from New York on April 28 to take up his new duties. He started with Goodyear as a stenographer shortly before the War.

Honor Charles Duryea

Charles E. Duryea was honored as the inventor of the first successful automobile built in America and as the first automobile manufacturer to use pneumatic automobile tires in this country at a luncheon in Springfield, Mass., on April 14, attended by approximately 300 persons. The luncheon was sponsored by the Springfield Kiwanis Club on the occasion of the 45th anniversary of the event. A special award was given to Mr. Duryea by the U. S. Rubber Company, owner of the Hartford Rubber Company, which built the first American pneumatic tire made expressly for the Duryea motor wagon in March, 1894. A tablet in his honor was unveiled after the luncheon at 47 Taylor Street, Springfield, bearing the inscriptions, "Birthplace of the Automobile Industry" and "Charles E. Duryea, Father of the Automobile."

WALTER J. MURPHY, managing editor of *Chemical Industries* for the past seven years and technical editor of the *Chemical Guide Book* since 1933, has resigned both posts to join the H. H. Rosenthal Company, Inc., New York City, distributors of chemicals, oils, drugs and allied products. He was at one time connected with the Naugatuck Chemical Company.

EDWIN NEWTON, research chemist, B. F. Goodrich Company, Akron, sailed from Los Angeles on April 28 for Kuala Lumpur, F.M.S., where he will engage in latex research work for the company.

J. F. DOCKUM has been named district sales manager for New England by the Columbia Alkali Corporation, Barberton, Ohio. He will maintain offices at 300 Babcock Street, Boston.

J. G. POLM, safety director, Goodyear Tire and Rubber Company, Akron, acted as chairman of the rubber section at the meeting of the Ohio Safety Congress held in Columbus the week of April 20.

R. E. POWERS, public relations department, B. F. Goodrich Company, Akron, has written a comprehensive story on the history and uses of rubber for the latest edition of the *Encyclopedia Americana*, recently published.

PAUL W. LITCHFIELD, president, Goodyear Tire and Rubber Company, Akron, sailed on the *S. S. Washington* early this month to attend the annual meeting of the British Goodyear affiliate.

Austrian Editor Here

Carl Magnus, editor of *Gummi und Asbestzeitung*, rubber and asbestos journal published in Vienna, Austria, is currently visiting the United States during a world tour. He was expected to reach the Pacific Coast early this

month and is scheduled to arrive in New York City on the *S.S. Reliance* on May 25th. Born in Hanover, Germany, in 1872, the son of the founder of the Continental-Caoutchouc Cie, Mr. Magnus entered his father's concern after completing his schooling in 1889. For several years he represented the company in various European countries and in 1897 he came to America as its agent. Returning to Europe in 1899 he served as sales director for Luettich, Englebert Fils et Cie, a Continental-Caoutchouc subsidiary. Later he directed the activities of a German rubber factory in Dresden for four years, and in 1904 went to Austria to take over the direction of a newly-established rubber trust, termed the Austrian Hungarian Rubber Goods Factories. During the World War, Mr. Magnus served in the German army, and at the close of the War resumed his position with the Austrian Trust where he remained until its dissolution a few years ago. He was also active in organizing other European trusts, including the German-Austro-Hungarian Tire Syndicate, the Union of Austro-Hungarian Bandage Factories and the International Asbest Syndicate. Communications addressed to Mr. Magnus in care of Dr. Ernst A. Hauser, Associate Professor of Colloid Chemistry, Massachusetts Institute of Technology, Cambridge, Mass., will reach him. Dr. Hauser is an old friend and Mr. Magnus is expected to spend several days at M. I. T.

TO OWNERS OF "LATEX IN INDUSTRY"

Copies of an addenda and errata list to Noble's "Latex in Industry" are available without cost by writing to THE RUBBER AGE, 250 West 57th Street, New York City.

Obituaries

W. H. Carothers

Dr. Wallace H. Carothers, research chemist for E. I. du Pont de Nemours and Company, Inc., Wilmington, Delaware, and recognized as a co-founder of synthetic rubber in this country, was found dead, apparently by his own hand, in a Philadelphia hotel on April 29. He was 41 years of age. Born in Burlington, Iowa, Dr. Carothers matriculated at Tarkio College and the Universities of Chicago and Illinois. Before joining DuPont in 1928, he taught chemistry at Tarkio College, the Universities of South Dakota and Illinois, and at Harvard. Working with Dr. F. B. Downing and Ira Williams in 1931, the trio developed a method for the production of synthetic rubber from coal tar, limestone, salt and water. Later work with the late Father Nieuwland, of Notre Dame, resulted in the perfection of the process for manufacturing DuPrene, now termed neoprene. At the time of his death, Dr. Carothers and his associates were working to refine neoprene to a point where it could be economically used in the manufacture of automobile tires. In addition to his work on synthetic rubber, Dr. Carothers was also active in the development of synthetic fibers. Since 1930 he had been an associate editor of the *Journal of the American Chemical Society* and in 1933 assumed the editorship of *Organic Synthesis*. He was a consistent contributor to scientific journals. Widely traveled, he was a member of German, Swiss and British chemical and scientific societies, in addition to his memberships in the A.C.S., the American Association for the Advancement of Science, and other American organizations. His clubs included the DuPont Country and University. He was also a member of Phi Beta Kappa, Sigma Xi, Phi Lambda Upsilon and Alpha Chi Sigma. Dr. Carothers was married last year to Miss Helen E. Sweetman, who survives him.

Charles J. C. Davol

Charles Joseph C. Davol, president and treasurer of the Davol Rubber Company, Providence, R. I., died in the Post-Graduate Hospital, New York City, on April 11, after an illness of three weeks. He had been stricken while vacationing in Miami, and was rushed to New York a week before his death. He was 69 years old. Mr. Davol was born in Brooklyn, New York, the son of native Rhode Islanders. He was educated in the schools of Providence and was graduated from Mowry and Goff's English and Classical School in 1885. He immediately joined the company which his father, Joseph Davol, had founded in 1870, and assumed the presidency in 1909. At the time of his death he had completed 52 years of continuous service with the concern. Well known as a sportsman and nature lover, Mr. Davol's yacht, the *Paragon*, is a familiar craft to yachtsmen in the East, while his kennels and shooting camp at his estate, Wildacres, in North Kingston, R. I., are among the finest in New England. His will, recently filed for probate, expressed the wish that the capital stock of the Davol Rubber Company be retained by his estate, stating that "the trustees shall cause the business of said Davol Rubber Company to be conducted, as nearly as may be, according to the policies which shall have been followed during my lifetime." His estate was estimated at approximately $2,000,000. Mr. Davol is survived by his widow and a nephew, Walter L. Davol, assistant managing executive of the Davol plant.

E. L. Tragesser

Edward L. Tragesser, who was associated with the B. F. Goodrich Company for 24 years as traffic manager and director of purchases prior to 1921 when failing health forced his resignation, died early last month at his home, 966 Thorndale Avenue, Akron, at the age of 56. Although ill health had decreased his activities in recent years, he was seriously ill only a week before his death. A native of Ohio, Mr. Tragesser spent most of his life in Akron. Shortly after being graduated from the Akron High School in 1897, he became an errand boy at Goodrich and gradually advanced to the office of director of purchases, the post he held when his health forced him to retire from active business for several years. After regaining his health, he entered the wholesale coal business and became resident manager of the North American Coal Corporation, Cleveland. Mr. Tragesser helped to organize the Akron Traffic Association, and was a member of the Silver Lake Country and Akron City clubs. He leaves a widow and two daughters.

Robert V. Whitehead

Robert V. Whitehead, vice-president and treasurer of the Trenton Saving Fund Society and formerly an officer and director of the Whitehead Brothers Rubber Company, Trenton, N. J., died on April 14 from a heart attack suffered shortly after he returned home from a Bermuda trip. Mr. Whitehead was graduated from the New Jersey State Model School. He was a member of the Trenton Club, Trenton Historical Society and Sons of the Revolution. Burial was in Ewing Cemetery, Trenton. He is survived by a son.

Elmer E. Dearth

Elmer Eldridge Dearth, general factory manager, Mansfield Tire and Rubber Company, Mansfield, Ohio, died at his home, 448 Edgewood Road, Mansfield, on April 9th, after a brief illness. Death was due to a heart ailment. He was 46 years old. Born in Lowell, Mass., Mr. Dearth was graduated from the Lowell Textile Institute. Shortly thereafter he joined the old Fisk Tire Company, Chicopee Falls, Mass., and was associated with that company for more than 20 years, serving as factory manager for many years. In 1933 he joined Mansfield as general factory manager. Mr. Dearth held memberships in both the University and Westbrook Country clubs. His fraternal affiliations included the Masonic Blue Lodge, chapter, council, consistory and shrine of Newark, N. J. Funeral services were held in Conshohocken, Pennsylvania, on April 12, with interment in Riverside Cemetery, Norristown, Pennsylvania. He is survived by his widow, father and two brothers.

Finlay Sinclair

Finlay Sinclair, credited with having made the first pneumatic tires by hand many years ago, died recently at Birmingham, England, at the age of 79. Mr. Sinclair is said to have been Britain's first acknowledged tire exert and was works manager for the Dunlop Rubber Company, Ltd., for the first 12 years of that company's existence.

New Source of Rubber

A rubber-bearing plant growing in argillaceous and calcareous soils, particularly in the neighborhood of Sicily and Lucania, has been discovered in Italy by Silvio Guglielminetti of the Chemical Warfare Service at Rome, according to the March 20th news edition of *Industrial and Engineering Chemistry*. Mr. Guglielminetti, who has been seeking possible sources of rubber in both Italian domestic and colonial plants, reports that the discovered plant yields between 5 to 10% of good quality rubber from its roots and corresponds with the *"krimsosaglizo"* plant, sometimes termed *"kok-saguiz,"* found in parts of Russia. The Italian Permanent Commission for Rubber Plant Culture proposes to cultivate the rubber plant in addition to collecting those growing wild.

O'Sullivan Increases Net

O'Sullivan Rubber Company, Inc., reports a net income of $74,935 before interest and Federal tax charges for the year of 1936. After these deductions net income amounted to $52,137, or 22 cents a share on 100,000 shares of unsubordinated common stock after allowing for dividend requirements on the preferred stock.

New Rubber Goods

Rubber Pellets for Washing

A sanitary glass washing unit, which makes use of specially prepared rubber pellets, is being featured by the Griswold Manufacturing Company, Erie, Pennsylvania. The principle used in the washer is based on that of sand blasting. The pellets are made of sponge rubber impregnated with emery. After impregnation they are put through a special process which removes the hard glazed surface. The pellets rest on the bottom of the washer. When a glass, cup or mug is pressed down in an upside down position, a jet of water is automatically released, driving the pellets up against the surfaces to be cleaned, scouring and washing away the residue, while, at the same time, sprays of water are playing on the entire surface of the article. Because of the action of the washer, the pellets are self-cleaning.

Vacuum Massage Glove

Utilizing the properties of rubber itself, the Vacuum Massage Glove is being featured by the Vacuum Massage Glove Company, 47 St. Johns Place, Brooklyn, N. Y. Cut from crepe rubber in the form of a mitten, this glove uses the vacuum principle of washing hands, e.g., the hands are lathered with ordinary hand or bath soap, the suds are permitted to remain on the hands, the glove is slipped over one hand and gripped tightly so that the rubber pores are pulled apart to create a suction effect, and then the hands are washed in the usual fashion. The glove is said to have excellent cleansing qualities because of its massaging effect which stimulates circulation in dried skin caused by gasoline and other solvents. It is especially recommended to garage mechanics, machinists, factory workers and others who labor with their hands.

Goodyear Latex Mattress

Resembling sponge rubber in its texture, an "air cooled" latex mattress has been developed by the Goodyear Tire and Rubber Company, Akron, Ohio. Molded in one piece, it is described as being porous, dustless, odorless, durable, light in weight, antiseptic and washable. The new mattress has no lumps and no metal springs, being molded completely from a latex composition. Goodyear points out that sufferers from asthma or hay fever, often affected by dust from the usual run of mattresses, have no such problem in the new latex type.

Rubber Water Skate

A water skate made of rubber has been invented and is being produced by Frank W. Min, of Paia, Maui, Hawaii. The skate is made entirely of rubber with the exception of the top and the foot rest, the latter being of metal construction. The keel has a thin piece of tin between layers of rubber. It is three feet in length, expanding to five feet when necessary, and six inches wide. In operation, the skates are strapped to each foot and inflated through valves provided near the ends of the skates. According to the inventor, sufficient inflation is provided to support a person upright in the water. Locomotion is accomplished by moving the feet in substantially the same manner employed when roller or ice skating. The keel under the water skate reduces side slipping when the skates are in use.

S & K Shoe Sole

S. and K. Rubber Company, Lima, Ohio, has developed a new shoe sole and heel especially for use by wearers of heavy shoes. These soles and heels are made of cord tire material into which is embedded fine, sharp steels. These steels, according to the company, cut through films of oil, water or grease and have a spring action when pressure from the foot causes them to protrude and grip the surface. The steels are said to act in a similar manner to an animal's claw. Termed Metal Flex soles and heels, they are intended for safety use.

Hard Rubber Boat

A 16-foot boat, with a 4-foot, 8-inch beam, weighing 430 pounds, made completely of hard rubber, is another rubber item which has invaded fields hitherto left to other materials. Conceived by the Thorpe Brothers, 445 Hawthorne Avenue, Yonkers, New York, the hard rubber boat is made for them by the Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc. It is molded in two sections, the mold being 18 feet overall and weighing 9,000 pounds. The mold was made by the Clifton (N. J.) plant of the National Rubber Machinery Company. When completed, the hard rubber boat is 3/16ths of an inch thick all around except at such spots as the keel, frame and bilges, where an additional 3/16ths-inch thickness is provided. The boat has been thoroughly tested for its sea-worthiness and found satisfactory in all respects, according to the Thorpe Brothers, who are now seeking financial support to launch an intensive sales program.

MARKETS

RUBBER—COTTON AND FABRICS—CHEMICALS

NEW YORK, MAY 11, 1937

Crude Rubber

HEAVY liquidation, attributed to dealer interests, caused a decline in crude rubber prices on the Exchange in mid-April, with improved factory buying halting the decline and resulting in moderate advances. Virtual withdrawal of both factory and dealer interests toward the end of the month, accompanied by frenzied selling on the part of foreign interests both here and abroad, resulted in one of the sharpest declines in the market in the last several months. The price for spot broke from 22.25 on April 27 to 20.72 the following day. Selling activities were spurred on by recurring rumors from abroad of changes in the gold money situation, but to date none of these rumors have proved to be factual. A steady price gain has occurred in the first ten days of this month, based on cautious but insistent factory buying, although the rumors again caused a one-cent drop from 22.50 to 21.50 on May 10. The market is considered especially erratic in view of the fact that statistics still favor higher prices. Quotations in the outside market, Exchange, London and Singapore, follow:

As of May 11

Plantations—

Ribbed Smoked Sheets—			
No. 1 Spot	—	@	.21⅝
July-September	—	@	.21¾
October-December	—	@	.21¾
No. 2	—	@	.21½
No. 3	—	@	.21⅜
No. 4	—	@	.21¼
Thin Latex Crepe	—	@	.26
Thick Latex Crepe	—	@	.26
Brown Crepe, No. 1	—	@	.21
Brown Crepe, No. 2	—	@	.20⅞
Amber Crepe, No. 2	—	@	.21
Amber Crepe, No. 3	—	@	.20⅞
Amber Crepe, No. 4	—	@	.20⅝
Brown Crepe, Rolled	—	@	.19⅞

Latex—

Liquid Latex, per gal.	.77	@	.78

Paras—

Up-River, fine	—	@	.22
Acre Bolivian, fine	—	@	.22¼

Balata—

Block, Ciudad	—	@	.30

LONDON MARKET

Standard Smoked Sheets—Buyers—May 11

July-September	—	@	10¾d
October-December	—	@	10¹³⁄₁₆d

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—May 11

July-September	—	@	10⅝d
October-December	—	@	10⁹⁄₁₆d

Reclaimed Rubber

Based on generally rising prices of raw materials, other than scrap rubber alone, prices on all grades of reclaimed rubber with the exception of floating tube stock have been advanced since our last report, some grades advancing two full cents. Reclaimers report unabated demand despite the recent drop in crude rubber prices. Practically all plants are operating at capacity. Current quotations follow:

Shoe

Unwashed, lb.	.07½	@	.07¾
Washed, lb.	.10	@	.10½

Tube

No. 1 (Floating), lb.	.19	@	.19¼
No. 2 (Compounded), lb.	.11	@	.11½
Red tube, lb.	.11	@	.11½

Tires

Black (acid process), lb.	.07½	@	.07¾
Black, selected tires, lb.	.06½	@	.06¾
Dark Gray, lb.	.10	@	.10½
White, lb.	.15	@	.15½
Truck, Heavy Gravity, lb.	.06	@	.06½
Truck, Light Gravity, lb.	.07	@	.07½

Miscellaneous

Mechanical blends, lb.	.04½	@	.05

Scrap Rubber

(Delivered Akron Mills)

There has been little variation in the price situation on scrap rubber stocks since our last report. Dealers report continued demand from reclaimers, and anticipate activity throughout the Summer months. There is a fair amount of stock immediately available, a situation which usually exists at this time of year. Current quotations follow:

(Prices to Consumers)

Auto tire peelings, ton	27.50	@	—
Mixed auto, ton	14.50	@	15.00
Beadless tires, ton	19.00	@	20.00
Clean solid truck tires, ton	28.00	@	30.00
Boots and shoes, ton	17.50	@	20.00
Arctics, untrimmed, ton	12.50	@	15.00
Inner tubes, No. 1, lb.	.12	@	.13
Inner tubes, No. 2, lb.	.06½	@	.06⅝
Inner tubes, Red, lb.	.06⅜	@	.06½

Cotton

Cotton prices have been extremely nervous in the past thirty days. They have been subject to erratic fluctuations, with sentiment easily swayed on comparatively short notice by a wide variety of influences, particularly with regard to government action. The recent official opposition to high prices and the apparent determination of the government to curb expenditures has kept the market apprehensive as to what possible steps may be taken in both of these directions, especially by the Department of Agriculture. Because of these conditions, cotton prices have swung widely in a 100 point range since our last report, touching a high for the period of 14.49 on April 12 and a low of 13.26 on April 29. After climbing steadily in the first week of the current month, the price dropped sharply from 13.58 on May 8 to 13.26 today (May 11). With the collapse of the speculative boom behind it, confidence seems to be returning to the market slowly, retarded somewhat by the knowledge that inventory positions in textiles are again normal. Quotations for middling uplands on the N. Y. Cotton Exchange follow:

	April 10	May 11		
	Close	High	Low	Close
July	13.87	12.85	12.73	12.73
September	13.52	12.62	12.62	12.62
December	13.28	12.63	12.50	12.52

Tire Fabrics

(Prices Net at the Mill)

Peeler, carded, 23/5/3, lb.	.36½	@	.36¾
Peeler, carded, 23/4/3, lb.	.37½	@	.37¾
Peeler, carded, 15/3/3, lb.	.34½	@	.34¾
Peeler, carded, 13/3/3, lb.	.33½	@	.33¾
Egyptian, carded, 23/5/3, lb.	.51½	@	.52
Egyptian, combed, 23/5/3, lb.	.56½	@	.57
CHAFERS			
Carded, American, 1 1/16", lb.	.35½	@	.36½
Carded, American, 1", lb.	.30½	@	.34

Sheetings

48x40	36 in.	5.50, lb.	.06⅜	@	.06½
40x40	36 in.	6.15, lb.	.06⅜	@	.06¼
40x36	36 in.	6.50, lb.	—	@	.05⅞
48x48	40 in.	2.50, lb.	—	@	.12½
48x48	40 in.	2.85, lb.	.11	@	.11¼
56x60	40 in.	3.60, lb.	—	@	.10½
48x44	40 in.	3.75, lb.	—	@	.09½
44x40	40 in.	4.25, lb.	.08⅜	@	.08½

Ducks

Enameling (single filling), lb.	.32½	@	.33½
Belting and Hose, lb.	.30	@	.31
Single filling, A grade, lb.	.15¼	@	.16¼
Double filling, lb.	.16¼	@	.17¼

Closing Rubber Prices on New York Commodity Exchange, Inc.

No. 1 Standard Contract of 10 tons

FROM APRIL 11 TO MAY 11

Date	Spot	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Sales
Apr. 11															
12	23.18	23.29	23.31	23.38	23.45	23.49	23.52	23.50	23.51	23.52	23.50	23.48	23.46		846
13	23.28	23.26	23.28	23.36	23.44	23.46	23.48	23.48	23.48	23.49	23.47	23.45	23.43		839
14	22.68	22.72	22.74	22.84	22.93	22.96	22.98	22.98	22.99	23.00	22.97	22.93	22.89		712
15	22.34	22.30	22.32	22.40	22.47	22.54	22.59	22.60	22.58	22.56	22.53	22.52	22.50		846
16	22.13	22.19	22.21	22.29	22.37	22.40	22.43	22.43	22.43	22.42	22.40	22.39	22.37		472
17	22.50	22.51	22.53	22.62	22.72	22.77	22.83	22.83	22.84	22.86	22.84	22.82	22.79		278
18															
19	22.93	22.94	22.96	23.06	23.17	23.22	23.28	23.28	23.28	23.29	23.27	23.25	23.22		579
20	22.50	22.52	22.54	22.67	22.74	22.80	22.84	22.84	22.83	22.82	22.80	22.78	22.75		329
21	23.18	23.22	23.24	23.34	23.43	23.47	23.50	23.49	23.48	23.48	23.46	23.43	23.40		334
22	23.06	23.11	23.13	23.19	23.23	23.31	23.35	23.36	23.36	23.35	23.35	23.33	23.31		588
23	22.93	22.98	23.00	23.05	23.10	23.16	23.23	23.23	23.22	23.21	23.19	23.18	23.16		360
24	23.18	23.21	23.23	23.29	23.35	23.36	23.38	23.39	23.39	23.40	23.38	23.37	23.35		95
25															
26	22.10	22.10	22.12	22.19	22.28	22.35	22.40	22.48	22.44	22.41	22.39	22.38	22.36		717
27	22.25	22.23	22.25	22.36	22.47	22.47	22.45	22.48	22.48	22.50	22.47	22.44	22.42		507
28	20.72	——	20.70	20.76	20.83	20.90	20.97	20.92	20.96	21.01	21.00	21.00	21.00		1278
29	20.72	——	20.67	20.76	20.85	20.92	20.96	20.97	20.98	21.00	21.00	21.00	21.01		792
30	21.10	——	21.10	21.17	21.25	21.29	21.33	21.34	21.34	21.35	21.35	21.35	21.35		598
May 1	20.97	——	20.94	21.01	21.09	21.13	21.17	21.17	21.18	21.19	21.19	21.19	21.19	21.19	177
2															
3	21.00	——	20.93	21.01	21.10	21.15	21.20	21.21	21.22	21.24	21.24	21.24	21.24	21.24	130
4	21.31	——	21.26	21.33	21.40	21.46	21.53	21.54	21.54	21.55	21.55	21.55	21.56	21.56	147
5	21.44	——	21.41	21.49	21.58	21.63	21.68	21.70	21.71	21.73	21.73	21.73	21.74	21.74	346
6	21.93	——	21.78	21.84	21.91	21.98	22.05	22.08	22.09	22.10	22.14	22.14	22.14	22.14	323
7	21.88	——	21.95	22.03	22.12	22.19	22.26	22.32	22.34	22.36	22.36	22.35	22.35	22.35	464
8	22.50	——	22.45	22.53	22.60	22.67	22.74	22.80	22.80	22.80	22.80	22.80	22.80	22.80	295
9															
10	21.50	——	21.48	21.56	21.63	21.69	21.74	21.76	21.78	21.80	21.81	21.81	21.81	21.81	646
11	21.63	——	21.57	21.65	21.72	21.80	21.89	21.88	21.92	21.96	21.97	21.97	21.98	21.98	421

Rubber CHEMICAL Markets

NEW YORK, APRIL 13, 1937

[All Quotations F.O.B. Works Unless Otherwise Noted]

ACCELERATORS

Organic			
A-1 (Thiocarbanilid)	lb.	.24 @	.28
A-5-10	lb.	.33 @	.36
A-7	lb.	.53 @	.65
A-11	lb.	.60 @	.75
A-16	lb.	.55 @	.65
A-19	lb.	.56 @	.75
A-32	lb.	.70 @	.80
A-77	lb.	— @	—
Aldehyde ammonia, crystals	lb.	.65 @	.70
Altax	lb.	— @	—
Captax	lb.		
Crylene	lb.	.55 @	.65
paste	lb.	.45 @	.55
Di-Ortho-Tolyguanidine	lb.	.44 @	.47
Diphenylguanidine	lb.	.35 @	.37
El-Sixty	lb.	.55 @	.65
Ethylidene aniline	lb.	.45 @	.47½
Formaldehyde aniline	lb.	.37½ @	.42
Guantal	lb.	.42 @	.51
Heptene	lb.	.40 @	—
Hexamethylenetetramine	lb.	.36 @	—
Lead Oleate, No. 999	lb.	.12 @	—
Witco	lb.	.12 @	—
Lithex	lb.	.18 @	.20
Methylenedianiline	lb.	.36 @	.37
Monex	lb.	3.25 @	—
Oxynone	lb.	.68 @	.80
Phenex	lb.	.50 @	.55
Pipsolene	lb.	1.60 @	1.85
R & H 40	lb.	.40 @	.41
R & H 50	lb.	.40 @	.41
R-2	lb.	1.50 @	1.80
Safex	lb.	1.20 @	1.25
SPDX	lb.	.75 @	—
Super-Sulphur No. 1	lb.		
No. 2	lb.		
Thiocarbanilid, drums	lb.	.24 @	.28
Trimene	lb.	.75 @	—
base	lb.	1.20 @	—
Triphenylguanidine	lb.	.58 @	.60
Tuads	lb.		
Ureka	lb.	.62 @	1.00
Ureka B	lb.	.62 @	.75
Ureka C	lb.	.58 @	.69
Vulcanex	lb.		
Vulcone	lb.		
Vulcanol	lb.		
Z-88-P	lb.	.48 @	.60
Zimate	lb.		
Inorganic			
Litharge, domestic	lb.	.07½ @	.08½
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Compounding Materials)			
Blues			
Prussian	lb.	.36 @	.37
Ultramarine	lb.	.15 @	—
Browns			
Mapico	lb.	.13 @	—
Umber, Turkey	lb	.04 @	.04½
Greens			
Chrome	lb.	.21 @	—
Chromium Oxide, bbl.	lb.	.21 @	—
Guignet's Green	lb.	.70 @	—
Reds			
Antimony crimson, 15/17	lb.	.48 @	—
sulfur, free	lb.	.48 @	.60
Indian English	lb.	.09 @	.10
Domestic (Maroon)	lb.	.11 @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red, f.o.b. Easton	lb.	.09¼ @	—
Whites			
Cryptone CB, No. 21	lb.	.05¾ @	.06
Cryptone, No. 19	lb.	.05¾ @	.06
Cryptone, ZS-20	lb.	.09 @	.09¼
Cryptone, ZS-86	lb.	.09 @	.09¼
Lithopone			
Albalith, black label—11	lb.	.04¼ @	.04½
Azolith	lb.	.04¼ @	.04½
Rayox	lb.		
Titanox A	lb.	.16 @	.16¾
Titanox B	lb.	.05¾ @	.06
Titanox C	lb.	.05¾ @	.06
Zinc Oxide—American Process			
American Azo:			
ZZZ (lead free)	lb.	.05¼ @	.05½
Anaconda, lead free	lb.	.05¼ @	.05½
Horsehead Lead Free Brand:			
Special—3	lb.	.05¼ @	.05½
XX Red—4	lb.	.05¼ @	.05½
XX Red—72	lb.	.05¼ @	.05½
XX Red—78		.05¼ @	.05½
XX Red—103	lb.	.05¼ @	.05½
U. S. P.—7, bbls.	lb.	.05¼ @	.05½
Kadox, black label—15	lb.	.05¼ @	.05½
Blue label—16	lb.	.05¼ @	.05½
Red label—17	lb.	.05¼ @	.05½
St. Joe, black label	lb.	.05¼ @	.05½
green label	lb.	.05¼ @	.05½
red label	lb.	.05¼ @	.05½
Zinc Oxide—French Process			
Florence White seal—7 bbls.	lb.	.06¾ @	.07
Green seal——8	lb.	.06¼ @	.06½
Red seal—9	lb.	.05¾ @	.06
Yellows			
Chrome	lb.	.14½ @	.15½
Mapico	lb.	.09½ @	—

BLACKS

Arrow "Aerfloted" Specification	lb.	.0535 @	.0825
Bone, powdered	lb.	.05½ @	.12½
Carbon, compressed	lb.	.0535 @	.0825
uncompressed	lb.	.0535 @	.0825
"Certified," Cabot	lb.	.0535 @	.0825
Spherons	lb.	.0535 @	.0825
"Disperso"	lb.	.0535 @	.0825
Drop, bbls.	lb.	.05½ @	.14
"Excello," compressed	lb.	.0535 @	.0825
"Fumonex"	lb.	.03 @	.07
"Gastex"	lb.	.03 @	.07
Lampblack	lb.	.07 @	.12
"Micronex"	lb.	.0535 @	.0825
"Supreme"	lb.	.0535 @	.0825
Thermatomic—"P 33"	lb.	— @	—
"Thermax"	lb.	— @	—
United "Dixie" & "Kosmos"	lb.	.0535 @	.0825

COMPOUNDING MATERIALS

Aluminum Flake	ton.	21.85 @	24.50
Ammonia carbonate, lump	lb.	.10½ @	.12
Asbestine	ton	13.00 @	15.00
Barium carbonate (98-100%)	ton	56.50 @	62.50
Barium Dust	lb.	.05 @	.06
Barytes	ton	23.65 @	31.15
Basofor	lb.	.04½ @	—
Bentonite	lb.	.02 @	.03
Blanc fixe dry f.o.b. works	ton	60.00 @	65.00
Calcene	ton	37.50 @	45.00
Catalpo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white, extra lt.	ton	45.40 @	60.00
heavy	ton	45.00 @	55.00
Clay, Kaolin, domestic	ton	7.50 @	15.00
Aerfloted, Suprex	ton	8.50 @	10.00
Congaree	ton	9.00 @	—
Dixie	ton		
Dixie, Jr.	ton		
McNamee	ton		
Par	ton		
Tensulite		15.00 @	—
Witco	ton	8.50 @	9.00
Cotton Flock	lb.	.11 @	.15
Glues, extra white	lb.	.28 @	.30
medium white	lb.	.14 @	.19
Kalite No. 1	ton	30.00 @	55.00
Kalite No. 3	ton	40.00 @	65.00
"Lime Crest" Industrial Filler No. 100	lb.	— @	—
Magnesium carbonate	lb.	.08 @	—
Mica	ton	35.00 @	44.00
Pyrax A	ton	— @	—
Rottenstone (powdered)	lb.	.02½ @	.05
Soapstone, powdered	ton	16.00 @	22.00
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	17.00 @	20.00
Whiting, commercial	ton	17.00 @	18.00
Columbia Filler	ton	9.00 @	14.00
English Cliffstone	ton	33.00 @	43.00
Witco	ton	7.00 @	—
Wood Flour	ton	20.00 @	25.00
Zinc Carbonate	lb.	— @	.11½
Zinc Stearate	lb.	.20 @	.23

MINERAL RUBBER

Black Diamond	ton	27.00 @	—
Genasco, solid (factory)	ton	25.00 @	27.00
Hard Hydrocarbon	ton		
Parmr, solid	ton	25.00 @	—
Pioneer, MR, solid	ton		
Pioneer-granulated	ton		

SPECIALTIES

Aromatics—Rodo	lb.		
Para-Dors No. 5145	lb.	2.00 @	—
Sunproof	lb.	.35 @	.37½
Sponge Paste	lb.	— @	.80
Tonox	lb.	.56 @	.60

SOFTENERS

Acids			
Acetic, 28%, bbls.	100 lb.	2.53 @	2.78
Nitric, 36 degrees	cwt.	5.00 @	6.00
Sulfuric, 66 degrees	ton	15.50 @	16.50
Acids, Fatty			
Laurex	lb.	.15 @	.16
Stearex Beads	lb.	.10¾ @	.11¾
Stearic, double pressed	lb.	.12½ @	.13½
Stearite	lb.	.10½ @	.11¾
Alkalies			
Caustic Soda, 76%	cwt.	3.05 @	4.25
Soda Ash, 58% C.L.	cwt.	1.25 @	3.05
Oils			
Cycline Oil	gal.	.20 @	—
Degras, bbls.	lb.	.07¾ @	.08
Fluxrite	lb.	.05½ @	.06½
Palm Niger	lb.	.05½ @	.06½
Para-Flux	gal.	.17 @	—
Petrolatum, light	lb.	.03⅛ @	.03⅜
Pigmentaroil, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
Pine, steam distilled	gal.	.64 @	.69
dest. dist., drums	gal.	.49 @	.50
Rosin Oil, cmpd.	gal.	.40 @	—
Rubtack	lb.	.08 @	.10
Seedine, c.l.	lb.	.07¾ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	.07 @	—
Witco Softener	gal.	.18 @	—
Woburn No. 8, c.l.	lb.	.06 @	—
Wobonite, c.l.	lb.	.05 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.05½ @	.06½
coal tar	ton	19.00 @	22.00
hardwood	ton	16.00 @	22.50
pine, 200 lb. gr. wt.	bbl.	6.00 @	6.50
Pigmentar, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
R. S. L. Resin	lb.	— @	—
Retort Pine Tar, drums	ton	20.00 @	26.00
Solvents			
Acetone, pure	lb.	.06 @	.06½
Alcohol, denatured, methanol, No. 1 bbls.	gal.	.33 @	.39
Benzene, 90%	gal.	.18 @	.23
Beta-Trichlorethane	gal.	— @	—
Bondogen	lb.	— @	—
Carbon, bisulfide	lb.	.05¼ @	.08
Carbon, tetrachloride	lb.	.05¾ @	.08
Dichlorethylene	lb.	.29 @	—
Dipentene, cml., drums	gal.	.41 @	.50
Dryolene (f.o.b. Okla.)	gal.	.10 @	.10½
Ethylene dichloride	lb.	.05½ @	.06¼
Plastogen	lb.		
Reogen	lb.		
Rub-Sol (f.o.b. Okla.)	gal.	.09 @	—
Trichlorethylene	lb.	— @	.09¼
Turpentine, spirits	gal.	.43 @	.47
dest. dist., drums	gal.	.33 @	.41
Waxes			
Beeswax, white	lb.	.39 @	.45
Carnauba, yellow	lb.	.46 @	.47½
Ceresin, white, dom.	lb.	.08 @	.11
Montan, crude	lb.	.10¾ @	.11¾
Paraffin (c.l.—f.o.b. N. Y.)			
Yellow crude scale	lb.	.02¾ @	—
White crude scale 124/126	lb.	.02¾ @	.03
Refined, 122/127	lb.	.04½ @	—

ANTI-OXIDANTS

AgeRite, Gel	lb.		
HP	lb.		
Powder	lb.		
Resin	lb.		
White	lb.		
Albasan	lb.	.70 @	.75
Antox	lb.		
B-L-E	lb.	.57 @	.60
Flectol-H	lb.	.54 @	.65
Flectol White	lb.	.95 @	1.15
Flectol B	lb.	.54 @	.65
Neozone	lb.		
Oxynone	lb.	.66 @	.75
Perfectol	lb.	.67 @	.75
Retardex	lb.	.35 @	.40
Santoflex A	lb.	— @	—
Stabilite	lb.	.57 @	.62
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.55 @	.60

MOLD LUBRICANTS

Aresklene	lb.	— @	—
Cocoa Soapstock	lb.	.06 @	.08
Dipex	lb.	.06 @	.08
Lubrex	lb.	.25 @	.30
Rusco, f.o.b. Nitro	lb.	.12 @	.30
Sericite, f.o.b. N. Y.	ton	65.00 @	—
Soap Tree Bark, cut, sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.23 @	—
Black	lb.	.08½ @	—
White	lb.	.095 @	.15
Brown	lb.	.095 @	.14
Neophax	lb.	.13 @	—

VULCANIZING INGREDIENTS

Sulfur Chloride, yellow (drs.)	lb.	.02½ @	.04
Sulfur flour.			
Refined, 100% pure (bags)	cwt.	2.55 @	3.65
Commercial (bags)	cwt.	1.60 @	2.35
Telloy	lb.		
Vandex	lb.		

Crude Rubber
Latex and Guayule
Reclaimed Rubber
Tires and Tubes

STATISTICS OF THE INDUSTRY

Rim Production
Automobiles
Gasoline
Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1922	301,076	101,843,188	15.10	4,809	1,921,828	17.84	296,267
1923	309,362	185,060,304	26.71	8,772	5,672,319	28.87	300,590
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1935:							
Sept.	34,659	8,637,048	11.12	468	120,438	11.48	34,191
Oct.	35,091	8,742,222	11.12	651	188,518	12.92	34,440
Nov.*	25,155	6,164,454	10.94	380	101,793	11.95	24,775
Dec.	38,417	9,930,710	11.54	1,821	523,997	12.85	36,596
1936:							
Jan.*	32,310	8,637,997	11.94	733	229,129	13.98	31,577
Feb.	32,879	9,293,711	12.62	625	199,956	14.27	32,254
Mar.*	33,447	9,845,776	13.14	1,172	390,551	14.88	32,275
Apr.*	44,218	13,967,712	14.10	984	343,785	15.59	43,234
May*	35,578	11,460,157	14.38	1,589	580,021	16.30	33,989
June	36,376	12,073,632	14.82	2,469	904,669	16.35	33,907
July	38,178	12,763,200	14.92	1,383	510,075	16.47	36,795
Aug.	40,027	13,364,916	14.91	840	307,114	16.32	39,187
Sept.*	48,368	16,691,919	15.41	656	244,554	16.64	47,712
Oct.	39,573	13,627,465	15.37	778	268,645	15.42	38,795
Nov.*	36,798	12,790,306	15.52	675	241,982	15.99	36,123
Dec.	49,312	17,555,705	15.89	677	267,745	17.65	48,635
1937:							
Jan.	42,002	15,408,242	16.38	844	372,053	19.69	41,158
Feb.	42,743	16,470,867	17.20	523	236,853	20.21	42,220
Mar.	38,682	16,030,267	18.50	1,146	522,931	20.37	37,536

* Revised.

Note: Annual figures for 1922-1936 revised on basis of information received on February 8, 1937. Figures for 1922 and 1923 include latex; guayule is included only in 1922.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule: Tons	Guayule: Dollars	Balata: Tons	Balata: Dollars	Jelutong: Tons	Jelutong: Dollars	Liquid Latex (1): Tons	Liquid Latex (1): Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	.....	.....	1,659	2,261,869	5,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1936:								
May	88	16,698	59	21,217	521	114,099	1,472	490,769
June	97	18,380	33	13,671	767	186,274	1,897	657,311
July	96	18,168	44	15,314	556	106,676	1,665	579,895
Aug.	146	37,147	72	23,715	321	64,769	1,761	602,992
Sept.	106	29,335	21	9,846	418	85,624	1,800	692,810
Oct.	114	31,489	11	4,815	452	102,485	1,392	500,817
Nov.	159	43,980	43	19,408	405	91,538	1,631	578,729
Dec.	134	36,972	14	7,247	538	109,208	2,070	735,156
1937:								
Jan.	160	44,166	10	4,348	247	56,056	1,337	535,546
Feb.	206	56,807	14	5,838	242	61,741	1,973	775,202
Mar.	136	37,453	29	13,949	898	187,413	2,216	968,053

(1) Weight given in pounds of dry rubber contained in latex.

Note: Annual figures for 1924-1936 revised on basis of information received on February 8, 1937.

U. S. Consumption of Crude Rubber

(Rubber Manufacturers' Association statistics raised to 100 per cent—All figures in long tons)
(All Quantities in Long Tons)

	Figures on Monthly Basis: 1930	1931	1932	1933	1934	1935	1936	1937
Jan.	36,194	28,557	29,648	22,645*	39,190*	46,636*	48,506	48,744
Feb.	33,302	28,797	31,821	21,392*	40,515*	42,720*	36,746	50,282
Mar.	35,540	32,788	29,505	17,483*	47,003*	42,153*	42,703	52,938
Apr.	39,686	33,321	27,518	25,928	44,853*	44,247*	51,897	.....
May	39,386	37,817	30,957	44,074	42,918*	41,101*	50,482	.....
June	34,195	37,916	41,475	50,743*	40,147*	36,156*	52,636	.....
July	29,508	31,397	29,976	49,614*	32,553*	35,917*	48,127	.....
Aug.	30,850	27,586	23,721	44,428*	33,216*	38,775*	46,657	.....
Sept.	25,515	23,638	23,847	35,281*	30,258*	37,086*	46,330	.....
Oct.	27,516	22,277	22,286	31,543*	31,253*	41,969*	49,509	.....
Nov.	23,691	22,943	23,231	28,831*	34,748*	42,310*	50,303	.....
Dec.	21,687	21,409	18,015	28,757*	36,569*	42,474*	49,626	.....
Tot.	375,980	348,986	332,000	400,719*	453,223*	491,544*	573,522	.....

* Revised.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks*	Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks*
1927	189,144	178,471	47.6	24,980	1932	75,608	77,504	23.4	16,354
1928	208,516	223,000	50.4	24,785	1933	99,560	81,602	19.9	20,746
1929	218,954	226,588	48.4	27,464	1934	110,010	100,597	22.2	23,079
1930	157,967	153,497	40.8	22,006	1935	122,948	113,078*	23.0*	25,069
1931	133,351	124,126	33.9	19,257	1936	150,571	130,048	22.7	30,573

Figures on Monthly Basis	Production	Consumption: Tons	Consumption: % to Crude	Stocks*		Production	Consumption: Tons	Consumption: % to Crude	Stocks*
1936:									
Jan.	11,665	10,039	20.7	26,145	July	12,330	11,816	24.6	22,602
Feb.	10,188	7,366	20.1	28,267	Aug.	12,856	10,993	23.6	23,750
Mar.	10,712	8,767	20.5	29,161	Sept.	12,959	11,170	24.1	24,950
April	11,382	10,333	19.9	22,274	Oct.	14,737	12,606	25.7	26,389
May	11,512	10,398	20.6	22,852	Nov.	14,357	12,029	23.8	28,135
June	11,935	11,547	21.9	22,738	Dec.	15,938	12,984	26.2	30,573
1937:									
Jan.	15,129	13,366	27.5	31,610	July	.....	.....	...	.....
Feb.	15,192	13,485	26.8	32,817	Aug.	.....	.....	...	.....
Mar.	14,462	15,393	29.1	30,277	Sept.	.....	.....	...	.....
April	.....	.....	...	.....	Oct.	.....	.....	...	.....
May	.....	.....	...	.....	Nov.	.....	.....	...	.....
June	.....	.....	...	.....	Dec.	.....	.....	...	.....

* Stocks on hand at the end of month or year.
[a] Revised.

U. S. Consumption of Gasoline

(Bureau of Mines Statistics)
(In Thousands of Barrels of 42 Gallons)

	1935	1936	1937		1935	1936	1937
January	28,147*	32,412*	33,696	August	43,097*	46,081	.....
February	26,580*	27,216*	32,000	September	37,976*	44,346	.....
March	32,272*	35,871	.....	October	41,566*	44,253	.....
April	36,363*	38,825	.....	November	35,991*	39,919	.....
May	39,381*	42,007	.....	December	33,872*	39,393	.....
June	38,086*	44,630	.....				
July	41,479*	46,638*	.....	Total	434,810*	481,591	.....

* Revised.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1925	26,001,664	1929	24,141,502	1933	8,713,962
1926	24,199,524	1930	17,364,096	1934	12,255,118
1927	19,700,003	1931	11,253,800	1935	18,664,456
1928	24,247,282	1932	6,261,336	1936	20,790,098

1937:		1937:		1937:	
January ...	2,123,723	May	.....	September ..	.....
February ..	2,022,258	June	.....	October ...	.....
March	2,166,218	July	.....	November ..	.....
April	2,269,680	August	.....	December ..	.....

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
1935																																
February	12¾	12¾	——	12¾	12¾	12⅝	12⅝	13⅛	13⅜	——	——	——	——	——	——	12⅞	——	13⅛	13⅛	13⅛	13⅛	——	13⅜	——	——	——	15⅛	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜
March	12⅝	12⅝	——	12⅝	——	12⅝	12⅝	12⅞	12	——	13	——	13	13	13	11⅞	11⅞	10⅝	10⅝	11⅛	10⅝	12	10⅝	10⅝	15⅝	15⅝	15⅜	15⅝	15⅝	15⅝	15⅝	15⅝
April	11⅜	11⅜	——	11⅜	11	11	11⅛	10⅛	11⅜	11½	11⅜	11½	11½	11⅜	11	11⅛	11⅛	11⅛	11⅛	11⅛	11⅛	11⅛	11⅛	11⅛	16	16	16	16	16	16	16	16
May	11⅜	11½	——	11⅜	11½	11½	11⅜	11⅜	11⅜	11½	11⅜	11⅜	12	12⅛	12	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
June	12⅛	12⅛	——	12⅛	12½	12½	12⅛	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
July	12⅛	12⅛	——	12⅛	12½	12½	12⅛	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	12⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
August	12⅛	12¼	——	12⅛	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝	16⅝
September	11⅜	11⅜	——	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
October	11⅜	11⅜	——	11⅜	12	11⅞	12⅛	12⅛	12⅛	12⅛	11⅞	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	12⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
November	13⅜	13⅜	——	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	13⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
December	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
1936																																
January	——	13½	13⅜	13⅜	——	13¾	13⅛	13⅛	13⅜	14	14⅛	——	——	14⅛	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅜	14⅞	14⅜	14⅜	15	15	15	15	15	15	15	15
February	15⅛	15⅝	15⅞	15⅞	15⅞	15⅞	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝
March	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝
April	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛
May	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝
June	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝
July	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Aug.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Sept.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Oct.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Nov.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Dec.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
1937																																
Jan.	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
Feb.	21	21	21	20⅞	20¼	21⅛	21⅛	21⅛	22⅛	22⅜	22⅜	22⅛	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜
Mar.	21⅛	21⅛	21⅛	21⅛	21⅛	21½	21⅛	22⅛	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜	23⅜
April	21⅛	21⅛	21⅛	21⅛	22½	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛
May	26⅞	26⅞	26⅞	26⅞	25¾	24⅛	21⅛	22½	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	21	——	——	21⅛	21½	21⅛	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Market)

Average Price per Pound for Years 1910-1929

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1910	206.60	1914	65.33	1918	60.15	1922	17.50	1926	48.50
1911	141.30	1915	65.85	1919	48.70	1923	29.45	1927	37.72
1912	121.60	1916	72.50	1920	36.30	1924	26.20	1928	22.48
1913	82.04	1917	72.28	1921	16.36	1925	72.46	1929	20.55

Average Monthly Price per Pound Since 1930

	1930 Cents	1931 Cents	1932 Cents	1933 Cents	1934 Cents	1935 Cents	1936 Cents	1937 Cents
Jan.	15.24	8.34	4.38	3.08	9.32	13.10	14.35	21.37
Feb.	15.85	7.70	4.03	2.95	10.45	12.92	15.48	21.33
Mar.	15.34	7.71	3.35	3.01	11.01	11.51	15.89	24.09
Apr.	14.93	6.43	3.02	3.56	12.10	11.55	15.98	23.44
May	14.24	6.49	3.09	4.95	13.26	12.05	15.62	
June	12.45	6.35	2.66	6.15	13.51	12.57	15.85	
July	11.24	6.37	2.89	8.01	14.60	12.10	16.49	
Aug.	9.96	5.38	3.63	7.31	15.47	11.98	16.25	
Sept.	8.28	5.08	3.84	7.30	15.36	11.55	16.46	
Oct.	8.20	4.87	3.65	7.64	13.96	12.62	16.55	
Nov.	9.01	4.65	3.44	8.66	13.04	13.15	17.97	
Dec.	9.05	4.64	3.24	8.87	12.98	13.28	20.01	
Average for Year	11.98	6.17	3.49	5.96	12.92	12.37	16.41	

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1937 Feb.	1937 Mar.	1937 Apr.	1937 May	Day	1937 Feb.	1937 Mar.	1937 Apr.	1937 May
1	10⅜	10¾	13⅜	10 1/16	17	10½	12⅜	10 7/16	
2	10 7/16	10¾	13	——	18	10⅜	12 1/16	——	
3	10⅜	10¾	13 1/16	10 1/16	19	10 7/16	12¼	11 7/16	
4	10⅜	10¾	——	10 7/16	20	10 1/16	12⅜	10 7/16	
5	10½	10 13/16	12 1/16	10⅜	21	——	——	11¾	
6	10⅝	11 1/16	12⅜	10⅜	22	10½	12 5/16	11⅜	
7	——	——	12⅜	10¾	23	10½	12 1/16	11 7/16	
8	10 7/16	11¼	12 7/16	10 13/16	24	10 7/16	12½	11¼	
9	10 7/16	11 7/16	11 15/16	——	25	10 13/16	12 7/16	——	
10	10½	11 7/16	12 1/16	10⅝	26	10¾	——	10 13/16	
11	10⅝	11½	——	10⅝	27	10 13/16	——	10¾	
12	10⅝	11 7/16	11½		28	——	——	10 7/16	
13	10⅝	11½	11 7/16		29	——	——	10	
14	——	——	11 7/16		30	——	13 7/16	10	
15	10½	11⅝	10 15/16		31	——	13¼	——	
16	10 1/16	12¼	10 7/8						

Average Monthly Price Per Pound

Month	1934 Pence	1935 Pence	1936 Pence	1937 Pence	Month	1934 Pence	1935 Pence	1936 Pence	1937 Pence
Jan.	4.429	6.434	6.758	10.378	Aug.	7.401	5.696	7.581	
Feb.	4.920	6.292	7.255	10.503	Sept.	7.409	5.508	7.577	
Mar.	5.136	5.745	7.450	11.766	Oct.	6.806	6.130	7.898	
Apr.	5.712	5.604	7.502	11.471	Nov.	6.294	6.308	8.572	
May	6.207	5.822	7.335		Dec.	6.295	6.340	9.580	
June	6.245	6.027	7.352		Average for Year	6.159	5.976	7.713	
July	7.053	5.801	7.696						

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1937 Mar.	1937 Apr.	1937 May	Date	1937 Mar.	1937 Apr.	1937 May	Date	1937 Mar.	1937 Apr.	1937 May
1	13.50	15.17	13.41	11	14.45	——	13.26	22	14.66	13.86	
2	13.60	14.98	——	12	14.47	14.49		23	14.54	13.79	
3	13.87	15.06	13.50	13	14.54	14.40		24	14.63	13.85	
4	13.84	——	13.55	14	——	14.36		25	14.55	——	
5	14.01	15.08	13.65	15	14.85	14.13		26	——	——	13.58
6	14.18	14.96	13.62	16	15.00	13.84		27	14.73	13.72	
7	——	14.67	13.58	17	14.88	13.99		28	——	——	13.55
8	14.05	14.80	13.58	18	14.73	——		29	14.76	13.26	
9	14.27	14.59	——	19	14.50	13.85		30	15.25	13.51	
10	14.44	14.53	13.40	20	14.55	13.97		31	15.10	——	
				21	——	14.06					

Average Monthly Price Per Pound

	1934 Cents	1935 Cents	1936 Cents	1937 Cents		1934 Cents	1935 Cents	1936 Cents	1937 Cents
Jan.	11.25	12.70	11.91	13.06	Aug.	13.40	11.48	12.28	
Feb.	12.28	12.58	11.53	13.15	Sept.	13.00	10.80	12.31	
Mar.	12.30	11.63	11.43	14.46	Oct.	12.48	11.28	12.30	
Apr.	11.80	11.73	11.71	14.23	Nov.	12.53	12.01	12.23	
May	11.44	12.25	11.68		Dec.	12.76	11.99	12.83	
June	12.20	11.89	12.02		Average for Year	12.36	11.88	12.11	
July	12.84	12.26	13.11						

World Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

At End of	ON HAND 1935	ON HAND 1936	ON HAND 1937	AFLOAT 1935	AFLOAT 1936	AFLOAT 1937	ON HAND AND AFLOAT 1935	ON HAND AND AFLOAT 1936	ON HAND AND AFLOAT 1937
Jan.	349,446	285,054*	201,915	42,066	43,870	55,096	391,512	328,924*	257,011
Feb.	340,264	282,902*	193,864	42,969	46,532	53,538	383,233	329,434*	247,402
Mar.	340,284	276,823*	191,618	44,485	58,935	56,994	384,769	335,758*	248,612
Apr.	337,586	264,228*		37,651	47,678		375,237	311,906*	
May	322,558	248,317		44,375	48,860		366,933	297,177	
June	324,218	245,886		55,581	47,228		379,799	293,114	
July	334,692	234,498		49,018	60,343		383,710	294,841	
Aug.	334,106	229,056		47,724	63,597		381,830	292,653	
Sept.	331,121	228,477		43,413	62,240		374,534	290,717	
Oct.	322,857	219,553		49,913	67,825		371,770	287,378	
Nov.	308,993	212,515		46,588	73,691		355,581	286,206	
Dec.	303,000	218,844		39,094	56,567		342,094	275,411	

(Rubber Manufacturers' Association figures raised to 100%)

* Revised.

Note: Complete figures for 1934 and 1935 were revised by the R.M.A. on May 1, 1936.

STOCKS IN GREAT BRITAIN

(No. of Tons in Wharves and Warehouses, not including Latex)

At end of	London 1935	London 1936	London 1937	Liverpool 1935	Liverpool 1936	Liverpool 1937
January	81,807	84,791	29,005	66,405	77,188	41,895
February	87,605	79,757	26,508	67,983	77,138	37,078
March	92,664	74,779	21,292	69,218	72,823	30,622
April	94,361	68,932		70,584	71,388	
May	95,722	61,349		71,927	69,150	
June	98,077	55,993		73,131	66,173	
July	99,226	49,575		74,915	63,715	
August	101,574	45,749		75,584	62,367	
September	101,198	44,364		76,263	59,485	
October	94,749	40,777		76,400	55,738	
November	90,542	37,495		76,301	51,184	
December	86,551	33,027		77,589	45,291	

(Figures from the Rubber Trade Association of London)

STOCKS IN OTHER CENTRES

(Figures from Statistical Bulletin of the Int'l Rubber Regulation Committee)

At end of 1936	Penang and Singapore [1]	Malaya [2]	Ceylon [3]	Holland	Para and Manaos
April	32,200	34,090	3,123	1,497	4,873
May	26,687	33,179	3,379*	1,360	4,522
June	28,260	34,166	3,057	1,070	4,502
July	29,443	34,395	3,610	1,026	4,696
August	28,289	34,849	3,961	979	1,742*
September	26,936	33,351	3,930	911	1,817
October	24,593	34,941	3,490	773	1,820
November	26,761	33,469	3,415	588	1,948
December	26,969	35,145	5,161	409	2,454
At end of 1937					
January	36,365	41,911	5,024	290	4,005
February	42,132		5,855	197	3,763

[1] Dealers' and Port Stocks. [2] Inside Regulated Areas. [3] Dealers' Stocks Only.
* Revised.

RUBBER STOCKS AFLOAT

End of: 1936:	Afloat for United States	Afloat for Europe	All Other * Afloat	Total * Afloat
March	58,935	16,820	14,245	90,000
April	47,678	17,025	18,297	83,000
May	48,860	18,670	21,470	89,000
June	47,228	20,200	22,572	90,000
July	60,343	20,300	25,357	106,000
August	63,597	19,800	15,603	99,000
September	62,240	18,090	15,670	96,000
October	67,825	20,790	17,385	106,000
November	73,691	19,270	13,039	106,000
December	56,567	24,800	21,633	103,000
End of: 1937				
January	55,096	24,920	17,984	98,000
February	53,538	20,000p	20,462	94,000
March	56,994	30,000p	38,006	125,000

* *Total Afloat* is an arbitrary estimate based on 1½ months' shipments as adopted by the Department of Commerce. *All Other Afloat* is determined by subtracting the amount of stocks in transit to the United States and Europe from the estimated total.
P—Preliminary estimate.

TOTAL WORLD STOCKS

(Figures from the Survey of Current Business)

At end of	1932	1933	1934	1935	1936	1937
January	623,416*	634,797	661,948	698,153	600,479*	446,087*
February	611,819*	626,227	663,308	686,195	599,355*	436,103
March	614,894*	638,428	666,382	678,809	574,594*	
April	615,893*	629,159	658,796	677,006	558,583	
May	612,474*	626,537	689,239	677,569	533,411*	
June	595,712	613,055	672,804	671,525	511,931*	
July	589,037	618,258	676,200	679,061	510,873*	
August	597,274	617,449	674,702	680,644	492,439*	
September	599,986	623,683	694,361	661,509	485,488*	
October	609,368	636,597	680,616	655,000	478,190*	
November	614,342	642,968	684,408	617,300*	458,637*	
December	629,898	654,890	705,975	613,987*	448,414*	
Monthly Average	609,502*	630,171	677,395	666,397*	521,033*	

* Revised.

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Figures for Recent Years

	1929	1930	1931	1932	1933	1934	1935	1936
Production	68,726	50,965	48,740	40,085	45,303	47,233	49,362	58,116
Shipments	69,395	53,638	50,061	40,251	44,094	46,687	50,183	55,363
Inventory [2]	11,838	9,003	7,775	7,644	8,888	9,455	8,196	11,114

Figures for Recent Months

	PRODUCTION 1935	PRODUCTION 1936*	PRODUCTION 1937	SHIPMENTS 1935	SHIPMENTS 1936*	SHIPMENTS 1937	INVENTORY 1935	INVENTORY 1936*	INVENTORY 1937
Jan.	4,626	4,579	4,980	3,663	3,875	4,509	10,398	8,917	11,377
Feb.	4,383	3,579	5,246	3,287	3,212	4,371	11,530	9,265	12,308
Mar.	4,346	3,640		4,204	3,857		11,675	9,087	
Apr.	4,512	4,857		5,144	4,904		11,003	9,035	
May	4,175	4,974		4,067	5,833		11,131	8,178	
June	3,910	5,612		4,262	5,793		10,755	7,835	
July	3,532	5,466		5,447	5,744		8,850	7,750	
Aug.	3,993	5,017		4,739	4,977		7,805	7,799	
Sept.	3,787	4,984		3,303	3,837		8,288	9,012	
Oct.	4,051	5,126		4,055	4,082		8,291	10,096	
Nov.	3,997	4,972		3,930	4,233		8,249	10,823	
Dec.	4,051	5,311		4,081	5,016		8,196	11,114	

AUTOMOBILE INNER TUBES

Figures for Recent Years

	1929	1930	1931	1932	1933	1934	1935	1936
Production	68,829	52,420	48,333	36,891	42,556	46,228	47,879	57,607
Shipments	70,592	54,938	50,021	37,911	41,391	45,046	48,067	54,626
Inventory [2]	12,807	9,999	7,922	6,749	7,815	9,180	8,231	10,985

Figures for Recent Months

	PRODUCTION 1935	PRODUCTION 1936	PRODUCTION 1937	SHIPMENTS 1935	SHIPMENTS 1936	SHIPMENTS 1937	INVENTORY 1935	INVENTORY 1936	INVENTORY 1937
Jan.	4,259	4,592	4,801	3,722	4,168	4,391	9,621	8,623	11,100
Feb.	4,171	3,556	5,091	3,362	3,446	4,536	10,466	8,699	11,734
Mar.	4,123	3,787		4,168	3,796		10,406	8,692	
Apr.	4,259	4,824		4,453	4,746		10,170	8,788	
May	3,892	4,819		3,451	4,919		10,615	8,719	
June	3,480	5,035		4,024	5,504		10,050	8,105	
July	3,251	5,177		5,269	5,758		8,005	7,725	
Aug.	3,894	5,039		4,556	5,136		6,939	7,621	
Sept.	4,125	5,161		3,426	4,231		7,565	8,627	
Oct.	4,435	5,397		3,987	4,108		8,053	9,977	
Nov.	3,942	4,739		3,687	3,995		8,161	10,732	
Dec.	4,048	5,121		3,962	4,819		8,231	10,985	

(1) These figures have been adjusted to represent 100% of the industry based on reports received by the Rubber Manufacturers' Association which represent 80% for 1931-1932-1933; 97% for 1934-1935; 81% for 1936. All figures through September, 1936, were revised in December, 1936. Annual figures are more accurate.
(2) Held by manufacturers at end of period indicated.
(*) Revised.

Automobile Production

	United States Total	United States Passenger Cars	United States Trucks	Canada Total	Canada Passenger Cars	Canada Trucks	Grand Total
1928	4,357,384	3,826,613	530,771	242,382	196,737	45,645	4,599,944
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933*	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,126
1934*	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935*	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936	4,454,535	3,676,063	778,472	162,322	131,308	31,014	4,616,857
1936							
April	502,775	417,133	85,642	24,951	20,247	4,704	527,726
May	460,565	385,507	75,058	20,006	16,389	3,617	480,571
June*	452,955	375,894	77,061	16,400	13,126	3,274	469,355
July	440,999	372,402	68,597	10,475	8,192	2,283	451,474
August	271,291	209,754	61,537	4,660	3,051	1,609	275,951
Sept.	135,130	90,597	44,533	4,655	2,481	2,174	139,785
Oct.	224,628	190,688	33,940	5,361	4,592	769	229,989
Nov.	394,890	341,456	53,434	10,812	10,086	726	405,702
Dec.	498,721	426,019	72,702	20,411	16,542	3,869	519,132
1937							
Jan.	379,843	309,594	70,249	19,583	15,009	4,574	399,426
Feb.*	363,833	296,583	67,250	19,707	14,415	5,292	383,540
Mar.	494,014	403,773	90,241	24,701	19,313	5,388	518,715

* Revised.
Note: U. S. figures represent factory sales; Canadian figures represent production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA [1]								DUTCH EAST INDIES [6]						
	Gross Exports	Imports	Gross Exports Minus Imports	Ceylon [2]	India & Burma [3]	Sarawak [4]	British North Borneo [5]	Siam [6]	Java & Madura	Sumatra E. Coast	Other D.E.I.	Indo-China [6]	Amazon Valley	All Other [6]	World Total [7]
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,415
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,530
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,753	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,103	17,545	87,400	112,058	175,470	20,170	8,903	2,985	1,008,663
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1935:															
July	48,975	11,257	37,718	4,106	766	1,752	1,164	1,729	5,909	5,663	8,664	1,939	427	709	70,546
Aug.	51,873	10,978	40,895	5,683	565	772	566	2,328	4,660	6,923	9,087	2,433	1,150	725	75,787
Sept.	51,247	10,365	40,882	4,053	710	1,758	421	1,949	4,089	5,862	9,637	2,601	1,121	669	73,752
Oct.	48,258	19,364	28,894	5,932	1,284	1,684	1,040	2,679	3,937	6,711	16,818	2,260	1,292	714	73,245
Nov.	43,147	10,518	32,629	4,288	2,273	1,141	455	2,303	3,724	3,818	8,863	2,445	907	876	63,722
Dec.	37,838	7,529	30,309	4,942	3,028	1,233	171	3,079	3,881	5,206	5,854	4,532	1,352	1,122	62,709
1936:															
Jan.	39,101	12,582	26,519	4,178	1,299	2,317	938	1,665	4,315	6,347	9,381	2,449	1,606	839	61,853
Feb.	38,436	18,857	19,579	3,664	1,382	2,107	529	3,663	4,789	6,643	15,851	2,892	1,201	1,051	63,353
Mar.	46,552	12,026	34,526	4,336	1,324	1,848	342	2,966	4,484	5,052	9,225	2,553	1,264	751	68,671
Apr.	36,251	14,702	21,549	3,172	1,230	2,053	869	1,596	4,895	6,446	13,032	2,416	1,056	947	59,261
May	46,568	12,527	34,041	2,560	1,117	2,354	517	2,077	4,258	6,015	10,766	2,281	956	776	67,718
June	40,049	15,026	25,023	3,766	1,226	1,386	461	3,737	4,577	6,519	14,588	2,733	917	823	65,756
July	53,114	19,038	34,076	3,773	1,359	1,399	1,035	3,734	6,133	8,578	17,946	2,738	964	933	82,668
Aug.	43,506	13,361	30,145	3,940	776	2,541	656	3,284	4,978	7,353	12,106	3,017	542	1,054	70,392
Sept.	44,110	10,039	34,071	5,367	664	1,139	537	3,259	4,531	6,241	10,175	3,505	1,119	937	71,545
Oct.	46,543	12,960	33,583	5,599	1,181	2,143	1,086	3,349	6,477	8,145	12,881	3,874	1,255	1,195	80,678
Nov.	47,342	16,923	30,419	4,960	1,322	1,950	701	2,260	5,398	7,109	16,718	3,872	1,592	1,163	77,464
Dec.	38,714	9,758	28,956	4,377	1,844		506	2,988	6,472	10,129	9,536	8,450	1,721	1,087	76,072
1937:															
Jan.	41,571	16,956	24,615	4,541	1,077	4,063	1,234	3,849	5,136	8,011	12,888	2,828	1,271	1,000*	70,513
Feb.	38,058	14,048	24,010	5,619	1,831	2,043	790	3,554		26,953		3,074	1,692	1,000*	70,566
Mar.	59,568	19,579	39,989	7,066	2,040	1,425	1,239	3,873		40,499		3,173	1,749	1,000*	102,053
Apr.	58,718	17,136	41,582												

(1) Malayan net exports cannot be taken as production, since imported rubber is largely wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 115 tons in 1923, 1,117 in 1924, 3,618 in 1925, 3,263 in 1926, 2,439 in 1927, 1,437 in 1928, 2,670 in 1929, and 1,274 in 1930. (2) Ceylon Chamber of Commerce statistics until 1926; rubber exported as latex is not included—such shipments were equivalent to 18 tons in 1923, 93 tons in 1924, 6 tons in 1925, 20 tons in 1926, about ½ ton in 1927, and 1 ton in 1928, and practically none in 1929, 1930 and 1931. (3) Official statistics. (4) Imports into Singapore and Penang. (5) Exports from "Other D.E.I." are chiefly wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 2,342 tons in 1923, 1,008 tons in 1924, 2,239 tons in 1925, 44 tons in 1926, 84 tons in 1927, 1,459 tons in 1928, 1,302 tons in 1929, and 2,656 tons in 1930. (6) Calculated from official import statistics of principal consuming countries, viz., United States, United Kingdom, France, Germany, Belgium and Netherlands, and includes guayule rubber. (7) This total includes the third column for British Malaya, "Gross Exports minus Imports," and all the figures shown for the other territories. * Figure is provisional: final figure will be shown when available

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(*Long Tons*)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	World Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,135	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,299	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,381	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	17,000*	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,976
1935:															
Nov.	25,756	2,942	4,731	6,258	4,389	4,361	2,000*	4,859	783	449	245	1,206	1,044	1,276	60,298
Dec.	38,072	4,779	5,522	4,823	2,567	6,112	2,500*	4,906	1,019	1,074	287	1,359	750	1,466	75,236
1936:															
Jan.	33,260	4,573	6,755	5,545	1,759	4,355	1,500*	467	1,260	760	369	736	664	767	62,770
Feb.	33,789	1,271	6,264	5,257	1,900	2,786	1,000*	94	735	799	106	497	1,312	344	56,154
Mar.	33,743	—1,227	4,333	4,569	1,811	5,170	1,000*	4,376	819	1,033	339	754	1,113	410	58,243
April	44,948	2,097	4,250	5,497	1,079	4,929	1,500*	3,251	919	1,097	238	848	679	603	71,935
May	35,549	302	4,335	4,639	2,221	5,531	1,000*	4,220	1,034	698	103	657	500*	667	61,456
June	35,901	—1,493	4,846	5,698	2,042	4,567	1,500*	2,427	1,635	579	—27	650	500*	323	59,148
July	38,556	—766	4,621	6,837	2,274	5,126	2,000*	1,733	1,363	713	183	1,094	500*	495	64,729
Aug.	41,094	—1,581	4,513	6,556	3,781	4,305	1,500*	3,128	807	789	42	1,145	500*	989	67,440
Sept.	49,483	—12	4,393	6,006	2,393	5,195	1,500*	2,922	2,297	514	471	1,090	300*	624	77,176
Oct.	40,301	—87	4,752	7,232	3,110	6,600	1,500*	2,761	1,092	817	343	1,171	200*	1,026	70,818
Nov.	37,897	—742	3,282	6,500	4,308	3,961	1,500*	2,162	964	1,090	445	1,388	200*	823	63,778
Dec.	50,838	—4,926	4,688	7,458	1,193	8,698	1,500*	3,426	1,184	759	276	1,206	200*	1,701	78,201
1937:															
Jan.	42,655	33	4,690	7,041	1,632	8,357	1,500*	2,633	582	854	269	1,115	200*	567	72,128
Feb.	44,398	—222	5,688	7,911	1,271	6,630	1,500*	3,048	304	1,363	245	452	200*	837	73,625
Mar.	39,888	343		7,668		6,935			1,293	1,641	371				

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced 12 per cent in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1] United States imports of guayule are included in this compilation. * Figure is provisional: final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

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